XXVII. *On the Root-Parasites referred by Authors to* Rhizantheæ; *and on various Plants related to them.* *By* William Griffith, *Esq., F.L.S. &c. &c.*

Read November 7th and 21st, and December 5th, 1843; February 20th, March 5th, June 4th and 18th, 1844.

§ 1. *An attempt to analyse Rhizantheæ.*

I HAVE been urged to present this paper to the Society by the hope of placing before the eyes of botanists evidence that, in the construction of the group called *Rhizantheæ*, whatever its rank may be, a remarkable diversity of characters has been sacrificed to an appearance resulting from parasitism on roots, and to an assumed absence of any ordinary form of vegetable embryo.

For this reason I have multiplied, perhaps unnecessarily, the details; the same reason will I hope excuse me for having considered, in one article, plants belonging in my opinion to widely different series.

Whether the evidence herein given is sufficient to cause the dismemberment of the group in question is a matter that must be determined by others; but every botanist must at least bear in mind, that the *Magister Scientiæ* has unequivocally declared that *Rafflesiaceæ* and *Cytineæ* are closely related to *Asarineæ*, and that the whole bearing of his observations on the female flower and fruit of *Rafflesia** is strongly subversive of the two principal points on which *Rhizantheæ* have been founded. Moreover, in none of his writings, that I have access to, has Mr. Robert Brown alluded to any affinity, beyond such as may arise from parasitical attachments, between *Rafflesiaceæ* and any other family of *Rhizanths*†, except *Cytineæ*.

I have no knowledge of the writings of any other botanists who may have objected to the adoption of the group in question. Messrs. Wight and Arnott

* Annales des Sciences Naturelles, 2nde série, Juin 1834, p. 369.

† Linn. Trans. vol. xiii. p. 224.

indeed, in the preface to their 'Prodromus Floræ Peninsulæ Indiæ Orientalis,' p. xxxi, mention an objection, founded on certain instances of conferrumination of those parts of an embryo that are usually distinct. But this, in my opinion, by no means constitutes a "perfectly simple seed like that of *Acotyledones*," and cannot be brought to bear upon a question, which has a very especial reference to the absolute absence of the usual form of the vegetable embryo.

I have frequently been tempted to make the paper more complete, or at any rate more pleasing to myself, by giving the characters of the undescribed natural families contained in the *Rhizantheæ* of Endlicher and Lindley, and which I might have taken to be represented by *Thismia*, *Sarcophyte*, and perhaps *Mystropetalum*; and though these might not have been adopted, I at least might have always abided by them and quoted them. But, independently of my not having had opportunities of examining many of the genera thrust into *Rhizantheæ*, it appears to me that such an attempt would have been very premature in the absence of information regarding the important physiological functions of impregnation and germination. I would in all cases rather be the doubtful, questioning indicator, than the confident fabricator of a group, of which we have but very imperfect knowledge.

OBS. I.—The points in which the plants constituting the *Rhizantheæ* are said to agree, are:

1. Parasitism.
2. Defective vascularity.
3. Homogeneous or anembryous sporuliferous seeds.

They are also generally unisexual, and of a fungoid or volvuloid mode of evolution (development).

M. Endlicher and Dr. Lindley appear to place most reliance on the second and third points of resemblance: yet it appears to me that there is not one which does not present important structural variations.

1. The *parasitism* can only be said to be constant in its effects, which are similar to those observed to occur (almost) constantly in all Phænogamous plants parasitic on roots. For there is a wide difference, it appears to me, between the parasitism of *Sapria*, *Cytinus*, and very probably of *Rafflesia*, and that of *Balanophora* and *Phæocordylis*, which appears to me to be of a

peculiar nature. I have but little doubt that a third variation in manner of parasitism will be found to exist in *Thismia*. A fourth variation, and one of a very important nature, is said to occur in *Pilostyles** (*Frostia*, Bertero), which is represented as parasitic on the branches of *Adesmia arborea* and certain *Bauhiniæ*, and which is admitted without any hesitation by M. Endlicher into *Rafflesiaceæ*. The exception that this plant offers to the almost invariable nature of plants parasitic on stems or their prolongations, might perhaps renew certain doubts as to its true nature; and in connexion with this I may observe, that it was to be remarked of *Sapria Cissi*, that when it happened to have germinated upon what appeared to be the true stem, the young plants did not make any considerable advances towards maturity.

On the other hand, in addition to any argument deducible from *Cuscuta*, which is, however, scarcely an analogous case, it may be urged that the real part of the plants to which *Rafflesia*, *Sapria* and *Brugmansia* are attached, requires more positive determination than it has yet received. For M. Blume, who appears to have seen *Rafflesia Patma* in its natural state, speaks of it (as quoted by Dr. Lindley, Introd. Nat. Syst., ed. 2. p. 391) as taking place on the creeping roots or stems of *Cissus scariosa*. Curious speculations might be indulged in respecting the parasitism of *Rafflesia*, *Brugmansia* and *Sapria*. Such might be founded (however slightly) on the difficulty of conceiving by what process a body like a seed can become so internal to the substance of the stock as to become surrounded by a wrapper, through which it subsequently bursts; on the fondness of these genera for the genus *Vitis*; and on the fact that accidental productions of certain parts of a vegetable may assume a definite form to a considerable extent.

2. *Defective vascularity*.—The once-asserted absence of any vascular system has been so amply contradicted by Mr. Brown, who has re-examined *Rafflesia*, and extended his inquiries to *Hydnora*, *Cytinus*, and all the *Balanophoreæ* he had access to, especially *Cynomorium* and *Helosis*; by Dr. Martius, who found vessels in *Langsdorffia*; and by M. Meyer, who also found them in *Hydnora*, that the question may now be considered to regard their quantity. Indeed M. Endlicher allows *Rhizantheæ* an imperfect vascular system; Dr Lindley allows them, in his 'Introduction to the Natural Orders,' a vascular system in

* Annales des Sciences Naturelles, 2nde série, Juillet 1834, p. 19.

the smallest conceivable degree. In all those I have examined with especial reference to this point, I have found vascular fascicles to exist to by no means an inconsiderable amount: in these fascicles, vessels with a spiral or annular fibre are to be found, extending in *Cytinus* and *Mystropetalum* into the segments of the perianthium.

Dr. Lindley's converse argument, that in "Endogens or Exogens equally developed spiral vessels would be most copious, and would exist in all the foliaceous organs," is perhaps scarcely admissible, while such conflicting ideas of relative perfection appear to prevail*. It is, however, a question that I do not pretend to be competent to handle: leaving it aside altogether, I would not be inclined to lay any great stress upon the total want of spiral vessels, or ducts or their modifications, while we are in possession of such instances as *Podostemon*, certain *Naïades*, and at least one *Lemnacea*. Dr. Lindley rids himself of this objection, which he founds, I believe erroneously†, on *Lemna*, by assuming that the small degree of development of these plants may be considered to account for the absence of spiral vessels. But this, however applicable to any plant in its earlier stages of development, can scarcely be so extended as to include plants sufficiently matured to present specific form, and perfect, and indeed complicated embryos.

3. *Homogeneous or anembryous sporuliferous Seeds.*—This, I believe, expresses the ideas of M. Endlicher and Dr. Lindley; but I must distinctly observe, that the last botanist does not make use of the term homogeneous by itself, which would be correct, but as connected with the want of an embryo and with a sporuliferous mass. And in a later work, the 'Elements of Botany‡,' he says, that the issue of fertilization of these plants is a mass of sporules analogous to those of Acotyledons.

Such a character as that adopted by these botanists is open to the gravest objections. It is not founded on observation, but on a hypothesis deduced from the structure of the seeds of *Scybalium fungiforme* and *Brugmansia Zippellii*, which I have not observed to exist in any of the subjects of this

* See also the preface to Lindley and Hutton's 'Fossil Flora,' in which Monocotyledons are stated to be as perfect, if not more so, than Dicotyledons. I have not the book by me.

† I have some recollection of having been shown spiral vessels in one of the English Lemnas by that unrivalled phytotomist Mr. Valentine.

‡ Page 226.

paper. And even granting that in all, the seeds did consist of cellular tissue and entangled connecting threads, my impression is that the germination should have been properly observed before the very important foundation of a subkingdom or even of a class should have been laid.

I have not found the appearances presented by the seeds to be uniform; and the only plants I have examined that would apparently bear such a hypothesis as that of being composed of a sporuliferous mass, are *Mystropetalum* and *Sarcophyte*.

In all the others, *Balanophora*, *Phœocordylis*, *Hydnora*, *Thismia*, and I believe *Sapria*, the seed contains or consists of a densely cellular homogeneous body, each cell containing granules and globules of an apparently oleaginous fluid; the appearance being that of some forms of albumen. These bodies are, I have no doubt, the embryos described by Mr. Brown as homogeneous and acotyledonous. Such he describes to exist in *many* other plants parasitic on roots, such as *Orobanche*, &c., and also in *Orchideæ*. To these I can add another very marked instance in *Burmannia*.

To the observations of Mr. Brown regarding the existence of similar embryos in *many* plants parasitic on roots, Dr. Lindley objects, *limiting himself however to* Orobanche; and to *Orchideæ* he applies an argument founded on our limited knowledge of their structure, which seems to me exactly applicable to *Rhizantheæ*, and which, if it had been kept in view, would have retained the various component parts of that class in what appear to me, at least, to be their proper and subordinate places.

It is also proper to observe here, that the celebrated L. C. Richard* has represented the existence of an embryo in *Cynomorium*. This observation of a botanist, who is considered by the first authorities as generally very accurate†, is contradicted by M. Endlicher, who attributes M. Richard's error to his having reasoned from analogy‡. But is the reasoning from analogy more liable to error than that of an opposite tendency, on which M. Endlicher's ideas of *Rhizantheæ* appear to me chiefly founded?

I have before alluded to a deformity in appearance of the seeds of *Sarco-*

* Mémoires du Muséum, viii. p. 423. t. 21. f. O, P.

† R. Brown, Linn. Trans. vol. xiii. p. 224, in the *note*.

‡ Meletemata Botanica, fasc. 11. p 9, line 19 &c.

phyte and *Mystropetalum* from that I have given above as the general characteristic. However much the component parts of these may be considered to resemble the spores of Acotyledonous plants, I do not attach any particular importance to it. For independently of errors of observation, from a defective series of specimens or other causes, the two genera are of widely different organization; and though one of them has appeared to me deficient in an ovulum, the other (*Sarcophyte*) has appeared to me in this respect analogous to *Balanophora*, which yet presented a decided form of the homogeneous acotyledonous embryo.

Again, such terms as "semina aëmbrya polyspora," and "seeds having no embryo, but consisting of a homogeneous sporuliferous mass*," are in another and a more important view not applicable to all these so-called *Rhizantheæ*. They cannot, for instance, be applied with any accuracy to the seeds of *Rafflesia*, *Sapria*, *Cytinus* and *Hydnora*, which throughout their earlier periods are altogether similar to ordinary ovula. So much so, that from his observations on the ovulum of *Rafflesia*, extended generally to Phænogamous plants, Mr. Brown deduced his curious remarks upon a most minute point, the origin of the integuments†.

To come properly, if definitions are to be trusted, under the term spore, it is required that germination take place from an indeterminate point. And to attach this condition to development from true ovula, is to negative one of the most constant rules connected with seeds, viz. the relation of particular and *definite* parts of the embryo to particular parts of the seed.

Such of the plants referred to *Rhizantheæ* that I have been able to examine which do not present this, as it appears to me, insurmountable objection, are *Balanophora*, *Sarcophyte* and *Mystropetalum*; in the two former of which the ovula may be assumed as consisting of simple sacs, without any integument or definable *punctum*, presenting perhaps something analogous to the reduction of the parts of the ovulum of *Loranthaceæ*.

Thus it may I think be stated, that in the *Rhizantheæ* of Endlicher and Lindley there are, so far as we yet know, two types of formation of the embryo;

* Both these definitions include contradictory terms. Compare definitions 464, 568, 581 and 590, of Lindley's 'Elements.'

† Note sur la fleur femelle etc. du Rafflesia, Ann. des Sc. Nat., 2nde série, vol. i. p. 370.

in the one it is developed from an ordinary ovulum; in the other from a sac or body, of which the analogy is by no means so evident. And it is to this that the sedulous attention of observers should be directed; for in the first type we may expect to find the same mode of fecundation, and germination from a definite and producible point. In the other, in the absence of knowledge of the early nature and attachments of the sac, all at present must be conjecture: the only analogy we can found thereon is the analogy of the protecting organ with an ordinary phænogamous pistillum; and even this may be considered as beginning to fail in *Balanophora*.

There is another point of view in which the absence of an ordinary form of embryo may be considered, and which is suggested by the resemblance the body, which I take to be embryo, has to some forms of albumen. It is easily, I think, conceivable that the existence of a particular form of embryo may be beyond the means of investigation not founded on the study of germination. For if there are all sorts of degrees of development of the vegetable embryo, of which *Tacca* and *Houttuynia* may be taken, perhaps, as the greatest extremes known in one direction, it is not altogether unreasonable to imagine the occurrence of a greater amount of reduction. And although so minute a form might not escape a practised observer occupied by a full series of specimens, it may easily escape one occupied by the ripe seed alone, and this for the most part derived from dried specimens.

It is also known, that the detection of the very first appearances of the embryo of ordinary Phænogamous plants demands higher appliances than have been hitherto bestowed on the study of *Rhizanths* generally. And it is I think to be expected that cases may occur in which the development of the embryo ceases at a point corresponding to its earliest degrees of development in ordinary instances. Granting such, its observation may easily be obscured in casual examinations.

Obs. II.—There are also theoretical arguments which, I venture to think, may be made to bear upon this question.

Against the arrangement of these plants into one group it may be urged, that the principles of variation, by which almost all the peculiarities of the three subkingdoms are mutually represented, are nowhere so limited; but, on the contrary, occur among plants possessed, so far as we can judge, of very different organizations. Thus the venation characteristic of *Dicotyledons* is

not limited to one particular group of *Monocotyledons*, but is presented to us at the three different points of *Smilacineæ* and *Dioscoreæ*; *Taccеæ*; and *Aroideæ*.

The occurrence among *Dicotyledons* of the characteristic number of *Monocotyledons* is much more diffused, for it is found in *Anonaceæ*, *Berberideæ*, *Menispermeæ*, &c.; in *Aurantiaceæ*, *Olacineæ*, *Limnantheæ*, *Meliaceæ*, *Ebenaceæ*, *Asarineæ*, *Loranthaceæ*, &c.

It may also be urged, and especially with reference to the situation of *Rhizantheæ* as a single group, that there is not, perhaps, a variation in form or in structure of primary importance in *Dicotyledons* that may not be met with in *Monocotyledons* and *Acotyledons*, and *vice versâ*. Thus the conical trunk of *Dicotyledons* is imitated by *Bambusa*, and in a very marked degree by some *Dracænæ**. The cylindrical trunk of *Monocotyledons* is imitated by *Cycadeæ*, by *Tree-Ferns*, and these again are sometimes beautifully imitated by the stem of *Carica Papaya*. The frondose form of growth of *Hepaticæ* appears in *Podostemon*. The dichotomy of *Fuci* is of common occurrence among *Naïades*, and *Fungi* are curiously imitated by some of the plants grouped among *Rhizanths*. And this interchange is in some form or other so general, that it may perhaps be said, that the existence of a peculiar structure in one subkingdom predicates its existence or its representation in the two others.

It therefore appears to me consistent with the order of nature, that the analogue of the reproductive organ of Acotyledonous plants (at least of those which appear to have sexes) will, whenever it be found†, be found both among

* I was first struck with the resemblance certain *Dracænæ* have to Dicotyledonous trees in the forest of Pulo Bissar near Malacca, in which there is a large arborescent species not to be distinguished from an ordinary Dicotyledonous tree, except by inspection of the leaves. On arriving here, in the progress of clearing, &c., so as to form a botanical garden, I examined casually several shrubby species of the same genus, and was surprised to find that the resemblance was not confined either to the mode of branching or the exterior of the trunk. The mixture of Endogenous and Exogenous characters is indeed remarkable; and I am disposed to coincide with Mr. Grant, who has set up several specimens in his usual beautiful style, that apparently, and very probably partially, the new formations of woody tissue are added to the outside. The figure of the remarkable Exogenous stem in Lindley's 'Introduction to Botany,' 2nd edition, f. 42. p. 100, resembles at first sight that of a *Dracæna*.

† I do not feel myself competent to enter on the question whether these homogeneous acotyledonous forms of embryo do constitute the required representations of the spores of *Acotyledones*. The study of their development and of their germination is an essential requisite in the settlement of this point.

Monocotyledonous and Dicotyledonous plants. This will allow for gradations in structure and for a number of independent points of contact. The grouping of these plants in either of the modes proposed does not do this, but, on the contrary, isolates *Dicotyledons*.

Obs. III.—If I consider *Rhizantheæ* in a mere systematic point of view, I find that the opinions regarding its *value* vary very considerably. This I take to be an objection to its being really founded in nature.

M. Blume in his 'Flora Javæ'* appears to limit the group to *Rafflesia* and *Brugmansia*, with a reservation, perhaps, in favour of *Cytinus*, *Apodanthes* and *Aphyteia*. So that Blume's *Rhizantheæ*, as therein defined, is somewhat equivalent to a natural group of two families, *i. e.* to an alliance of Dr. Lindley†.

M. Blume considers (*loc. cit.*) that *Rhizantheæ* are closely allied to *Fungi*, but he adds, "*altiori tamen evolutionis gradu ab iisdem recedunt plantarum perfectiorum magis absolutam mutuando formam*"; and although he notices that Mr. Robert Brown had referred them without doubt to *Dicotyledones*, yet he himself is inclined to adhere to his original opinion, published in the Batavian 'Ephemeris,' that *Rhizantheæ* or *Rafflesiaceæ* are in nowise to be associated with *Phanerogamæ*, but are to be ranked among the more perfect *Cryptogamæ*, close to *Marsileaceæ*. And he appears to have been so guided by these views, that in his description he makes no mention of the ovula, but disguising their true nature by the terms *pseudocarpium*, *peridium*, or *sporangium*, applied to a true ovarium, passes at once to the spores, although the identity of the earlier state of these with most ordinary ovula is plainly enough represented in the illustrations‡. He even apologises for calling the integuments of the flower perianthium, owing, he says, to their close resemblance to those of cotyledonary plants!

In M. Endlicher's 'Genera Plantarum,' which gives, I imagine, his latest opinions regarding these plants, *Rhizantheæ* form the class of a "*regio*" divided into three cohorts, and which, commencing with *Hepaticæ*, ascends through *Filices* to *Cycadeæ*, and thence to *Rhizantheæ*. The next division, a "*subregio*," commences with *Gramineæ*!

* Flora Javæ, *Rhizantheæ*, p. 2.

† The synonomy of M. Endlicher in his 'Genera Plantarum,' pp. 72 and 75, and that of Dr. Lindley in his 'Introduction to the Natural System,' ed. 2. pp. 389 and 392, appear to me on this score very faulty.

‡ Flora Java, *Bragmansia Zippellii*, t. 5. f. 16.

The classes of M. Endlicher, of which *Rhizantheæ* form the tenth (or perhaps the eleventh, as *Selagineæ* and *Zamiæ* are both numbered ix.), are equivalent to the alliances of Dr. Lindley. But the classes of the last distinguished botanist, of which *Rhizantheæ* form the fourth, appear to be equivalent to the *regiones* of M. Endlicher; so that in whatever measure these botanists may agree in the adoption of *Rhizantheæ*, it is evident that their ideas of its value as a natural group have no common measure of agreement. I may be also allowed to remark, that a more recent classification of *Rhizantheæ* as *Sporogens**, a division of the natural subkingdom *Monocotyledones*, shows that Dr. Lindley does not entertain that fixedness of opinion which I cannot help thinking would exist regarding any division, more especially one of so high a value, approaching to the true order of nature.

In making *Rhizantheæ* a class, M. Endlicher appears to have lost sight of the principles of system on which his other classes are founded, the orders or families of which have generally sufficiently close relations†. The same may be said of its situation between *Cycadeæ*, and, "*longo intervallo*" indeed, *Gramineæ*.

Dr. Lindley, in elevating the same group to the rank of a primary division of the vegetable kingdom, has avoided this more immediate consociation of dissimilar plants. For a class, as he constitutes one, must have wide differences in organization, just as *Monocotyledones* include *Orchideæ* and *Naïades*; or *Dicotyledones*, *Compositæ* and *Ceratophyllum*. And it might be assumed, that the hiatus between its constituent parts would be supplied by future discoveries. But he has not kept in view the incongruity of *Rhizantheæ* (and his second additional class *Gymnospermæ*) in stamp of peculiarity and variety of form, in number of species and general importance, with the other three natural classes (or subkingdoms); and he has placed the class in question after‡ or in§ *Monocotyledones*, as though such a transition could only take

* Lindley, Elements of Botany, pp. 227, 229, 237.

† Compare this class *Rhizantheæ* with the classes indicated by Mr. Robert Brown here and there, as that comprising *Rubiaceæ*, *Apocyneæ*, *Asclepiadeæ* and certain *Gentianeæ*; or that of *Malvaceæ*, *Sterculiaceæ*, *Chlenaceæ*, *Tiliaceæ* and *Byttneriaceæ*; or that of *Labiatæ* and *Verbenaceæ*; or *Dilleniaceæ* and *Magnoliaceæ*.

‡ Introduction to the Natural System, ed. 2. p. 389.

§ Elements, p. 227–230.

place between *Monocotyledones* and *Acotyledones*, and in neglect of the structure of *Rafflesiaceæ*, and perhaps of some others. Lastly, he has separated two classes not marked by any sufficient absolute particularity of form or of structure; while he has allowed to remain undisturbed the third great subkingdom, in which several peculiar natural types exist, and in which, if there be any truth in the MacLeayian zoological system, they are to be found.

Obs. IV.—The line of argument I have endeavoured to follow has been drawn with especial reference to three points.

In the first, I have endeavoured to extend the objections urged by Mr. Robert Brown, founded on the presence of a vascular system, and the absence of any abstract peculiarity in the embryos of these plants. I have also attempted to show that these plants are not similar in their parasitism; and that, even in the moicty I have examined, there would appear to be two remarkably different types of development of the embryo.

Secondly, I have alluded to the opposition presented, it seems to me, by such a group as *Rhizantheæ* to the system of nature, a chief part of the plan of which seems to me to consist in an extensive interchange of characters, either positively by structure, or negatively by imitation of structure.

Thirdly, I have adverted to a want of uniformity in opinion of the founders regarding its rank or value, incompatible, it appears to me, with any group of the system of nature.

And in conclusion I beg to add, that my impression is that *Rhizantheæ* form an entirely artificial group, not even sanctioned by practical facility, which is the only merit of an artificial association: and that its adoption is a retrograde step in the course of philosophical botany, and in direct opposition to those rules on which the standard divisions and families of the vegetable kingdom have been hitherto based, and I think in most cases not unsuccessfully. "*Vera autem scientia ex præmissis integræ organisationis studio dedita, non hæret in pauciorum signorum delibatione, sed omnes omnium organorum modos tenetur perpendere, præpositâ eorum structuræ et actionis accuratâ expositione.*" Jussieu.

"*Nulla hic valet regula à priori, nec una nec altera pars fructificationis, sed solùm simplex symmetria omnium partium.*" Linnæus.

---

§ 2. *Description of a new Genus of* Rafflesiaceæ.

Sapria.

Char. Gen. *Flores* dioici. *Perianthium* duplici serie 5-partitum, æstivatione imbricativum; faux coronâ foratâ clausa; tubus intus 20-carinatus. Mas. *Antheræ* 20, uniseriatim infra caput columnæ fungiforme verticillatæ, discretæ, bi–triloculares, apice porosæ. *Ovarii* cavitas nulla. Fœm. *Antheræ* castratæ. *Ovarium* uniloculare; placentæ indefinitæ, parietales; ovula indefinita. *Columnæ* apex fungoideo-dilatatus (e medio conum verrucosum exserens, disco piloso). *Fructus* ——. Planta *parasitica, habitu* Rafflesiæ. Flos *magnus, carnis colore, odore putrido.*

Sapria Himalayana.

Descr. Planta radicum *Cissi* parasitica, constans ex axi brevissimâ, squamis imbricatâ, uniflorâ. Discus annulusve (extensio corticis) orbicularis, extùs verrucosulus, margine irregularis, interdùm subdentatus, sæpiùs integer, axeos basin circumdat. Squamæ imbricatæ oppositæ, (ut in *Brugmansia**,) magnitudine variæ, exteriores minores rotundatæ ferè omninò sphacelatæ, interiores erecto-adpressæ, subovales, albido-carneæ, apicibus marginibusque plus minus sphacelatæ. Flos dioicus, quantùm vidi fœmineus e masculo segregatus, rariùs ex eâdem radice oriens; diametro 5–5½ uncialis, odore putrido. Perianthium superum, carnosum, campanulatum, biseriatim 10-partitum; laciniæ reflexæ, oblongæ, verrucosæ, interiores paullò minores: verrucæ plurimæ, sparsæ, formâ irregulares, sæpiùs oblongæ vel rotundatæ, rarò lobatæ, iis faucis elongatis; colore (in alabastro) pulchrè luteo, floris expansi ochroleuco. Faux semiclausa annulo (vel coronâ) carnoso, insigni, horizontali, atro-purpureo, centro foramine magno irregulari vel subpentagono forato, suprà processubus filiformibus (cujus capita rugosula conspicua), creberrimis quasi ramentacea, foraminis margine excepto. Æstivatio biseriatim imbricata. Tubus perianthii intùs papilloso-pubescens, multotiès (20-) carinatus, carinis annulum versus obsoletis, fundum tubi versus dilatatis et conniventibus in annulum, floris masculi multò magìs evolutis et cum sulcis totidem columnæ continuis. Color tubi extùs albidus, intùs sanguineus; carinæ annulusque saturatè purpureo-sanguineæ; laciniæ intùs coloris carnis, extùs carneæ margine lutescentes. Columna robusta, brevis, parcè papilloso-pubescens, sursùm discoideo-dilatata in caput fungiforme; discus margine elevatus; fundus exserens conum verrucosulum (præsertim in flore fœmineo), utrinque pilis longis adspersus: color sanguineus, capite pulchrè rosaceo. Antheræ 20, simplici serie verticillatæ infra caput columnæ, bi–triloculares, sessiles, basi obliquæ, oblongæ, apice

* Blume, Flora Javæ, *Rhizantheæ*, tab. 4.

umbilicatæ, poro deorsùm spectante dehiscentes, floris fœminei castratæ et demissiùs circa columnam verticillatæ. Pollen viscosum, glabrum, læve. Ovarium uniloculare, floris masculi solidum; placentæ plures parietales, ovulis innumeris tectæ; ovula anatropa, tegumento uno, nuclei apice prominulo.

Hab. Jugi Himalayani montes Mishmeenscs, in sylvis umbrosissimis, humidis, ripæ fluminis Brahmapoutræ apud Ghalooms, et torrentis Paieen Panee apud Khoshas: alt. circiter 3000-5000 ped. Lat. Bor. 27° 57′; Long. Or. 96° 27′.

Obs. I.—I met with this plant in 1836, while on a visit to the Mishmee hills to the extreme east of Upper Assam: in both the localities mentioned it occurred in abundance in every stage. Sketches and a description of the bud and flower were made upon the spot; but I reserved the fruit for subsequent leisure examination. However, of all the specimens brought away in spirits, I have now only three fragments of the base of the male flower.

The species of *Cissus* on which it was found is a large climber with flattened stems, quinate or septenately pedate leaves, remotely and coarsely serrate, and large subedible white fruits. This plant is common enough in the forests of Assam, but in that country does not, so far as I could learn, present the parasite.

Obs. II.—The attachment of this plant to the *Cissus* takes place by a cone, which is in apposition with the bark of the disc (an extension of that of the root), and also with the woody system. If care be taken to procure a central section of the parasite and stock, it will be found that the bark, which forms the outer part of the disc, comes into contact with the parasite a short distance below the bases of its outermost scales. As the bark however follows the curve of the disc, and as the parasite is tapered downwards and inwards into an inverted cone, there is necessarily a rather large mass interposed between the two, especially at the lower part. This is filled up by cellular tissue, the cells of which have a linear, slightly curved direction. In this occur several series of a tissue, which, except in its oblique direction, is evidently part of the woody system of the stock. The lowermost of these oblique lines passes down under the apex of the cone of the parasite, and is in fact the outer fascicle or bundle of the main body of the wood of the root.

Under this occurs the general bulk of the wood, consisting of fascicles of vessels and fibres, divided from each other by cellular tissue, having the same

direction with that chiefly forming the interposed mass above alluded to, and like it and the bark abounding in fascicles of *raphides*.

The cone of the parasite chiefly consists of cellular tissue; it is traversed by somewhat irregular vascular fascicles: of the origin of these, as also of the nature of their relations with the stock, I am quite ignorant.

OBS. III.—This plant cannot with any exactness be said to be scantily provided with vessels, both ducts and spiral vessels being easily detected in the longitudinal fascicles of the cone of insertion. Similar longitudinal fascicles exist in the scales in the simple form, in which respect it would appear to agree with *Rafflesia*. Of the nature of the vascular supplies of the perianth I can say nothing; the base of the tube, however, presents on a transverse section a well-marked simple series of vascular bundles.

The column of the male flower is well supplied, the outer series appearing to belong to the staminal apparatus.

OBS. IV.—The plicæ or carinæ of the inside of the tube have seemed to me to be cellular. From their appearing to alternate with the anthers, and from their colour resembling that of the surface of the column below the anthers, they may perhaps be considered to represent a second series of stamina, a circumstance that occurs in one instance in *Asarineæ*. Their disposition likewise suggests the probability of their exerting some mechanical action on the annulus.

OBS. V.—The inner membrane of the cells of the anthers appears, at least after maceration in spirits, to have little or no connexion with the cavity which it lines; a cross section, indeed, often presents the *loculi* as divided by two or more *septa*, which is found to be due to the partial separation of the lining membrane from the walls, with which previously it may be supposed to have been in contact.

Of the nature and situation of the stigmatic surface I can say nothing, in default of female specimens. The whole surface of the concave part of the fungoid head of the column of the male flower is minutely cellular, and not stigmatic in appearance. The cells of the outer surface above are much the same, but towards the base they have a peculiar appearance.

Great obstacles to independent impregnation would appear to be presented by the separation of the sexes, by the viscidity of the pollen, and the limited

and inelastic dehiscence of the anthers. And their situations in the above circumstances, under that part of the column which may perhaps be considered as stigmatic, would I think be a great obstacle, even supposing the flowers were hermaphrodite.

The presence of an annulus or corona, again, unless it be found to possess some power of closing, (which, judging from the elevated border of that of *Thismia* and that of the flower-bud of *Sapria*, may not be improbable,) does not, to say the least, add to the facility of impregnation by such foreign agents as insects. However, if the firmness and nature of the attachment of the plant, its short, robust stature and closeness to the ground, and the protected situations in which it is found be taken into consideration, it is scarcely possible to suppose that any agency but that of insects would be likely to carry through the first parts of the process of fecundation. To such agency it appears beautifully adapted by its fleshy appearance and odour, viscid pollen*, and probably immense stigmatic surface.

Obs. VI.—The fruit, to the best of my recollection, was somewhat larger than the flower, and crowned with the brown, erect or connivent, hardened segments of the perianth. Its structure was much the same as that of the ovarium, and the seeds appeared to me, in the hard waxy nature of the embryo, very like those of *Thismia*.

Obs. VII.—The genus appears to be intermediate between *Rafflesia* and *Brugmansia*. From the former, to one species of which, *R. Manillana*†, it approaches in size, it differs in the 10-partite perianth, the nature of the *corona faucis*, the non-immersion of the anthers in cavities, their internal structure, and the absence of the remarkable processes of the discoid apex of the column.

From *Brugmansia* it differs in the imbricated æstivation of the 10-partite perianth, the presence of a well-developed *corona faucis*, the definite anthers opening by a single pore, and somewhat also in the shape of the head of the column.

* Although viscidity might conjecturally be an impediment, practically it does not appear to be so. Every one who has dissected Asclepiadeous, or particularly Orchideous flowers, must be aware of the tenacity with which the pollen apparatus generally adheres to the knife: so that it would appear more likely to remain sticking to the legs or body of the insects than to separate from them, on coming into contact with the comparatively lax viscid secretion of the stigma.

† Annals of Natural History, vol. ix. No. 59, for July 1842.

With *Pilostyles*, granting that plant to belong to the family, it is not likely to be confounded.

§ 3. CYTINEÆ.

I have nothing to offer on the affinities of this family, to which the two succeeding genera are referred. Mr. Brown, in a note on the female flower and fruit of *Rafflesia* in the 'Annales des Sciences Naturelles,' n. s. p. 369, is represented as being of opinion that both *Hydnora* and *Cytinus* may be grouped in the same family with *Rafflesia* and *Brugmansia* (Bl.), and that this family is intimately allied to *Asarineæ*. The same great authority had previously pointed out the affinities of *Rafflesiaceæ* with *Nepentheæ*.

The difference in the direction of the nuclei of the ovula in *Cytineæ* and *Rafflesiaceæ* may perhaps be of some use in discriminating them: on this point, however, it may be necessary to observe, that in *Nepenthes distillatoria* of the Calcutta Botanic Garden, the most marked instances of *ovula anatropa* and *antitropa* are to be met with in the ovaria at their mature state. This curious conjunction of forms of ovula, usually so distinct at the period of fecundation, is probably the cause of the discrepancies in the accounts of the direction of the radicle of the ripe seed of that genus.

Cytineæ and *Rafflesiaceæ* appear to me completely misplaced in Endlicher's 'Genera'* and Lindley's 'Introduction to the Natural System'†, and equally so in Reichenbach's 'Conspectus Regni Vegetabilis'‡. Batsch§ formed *Cytinus* into a family, *Asarineæ*, with *Aristolochia*, *Asarum*, *Pistia* and *Tacca*. Bartling‖ places them with *Asarineæ*, *Tacca* and *Balanophoreæ* in a class called *Aristolochieæ*, with which he commences his 'Vegetabilia Dicotyledonea.' It is remarkable that he places "*ad calcem Cytinearum*," *Gonyanthes* (Bl.), now I believe referred to *Burmannieæ*.

To the account of the two genera of *Cytineæ* I have added an account of two Asarineous plants.

* Genera Plantarum, p. 75. † Page 392. ‡ Page 78.
§ Tabula Affinitatum Regni Vegetabilis (1802), p. 244. ‖ Ordines Naturales, p. 79.

HYDNORA, *Thunb. Act. Holm.* 1775, p. 69. t. 2; 1777, p. 144. t. 4. f. 1. (fide Endlicher). *Meyer, Nov. Act. Nat. Cur.* xvi. 773. t. 58, 59. *Endlicher, Gen. Pl.* 75. no. 724.

Aphyteia, Linn. Amœn. Acad. viii. 312. Gen. Plant. (Schreber) ii. no. 1104. p. 452. Jussieu, Gen. Pl. 436. Harvey, Gen. S. Afric. Pl. 299.

CHAR. GEN. *Flos* hermaphroditus. *Perianthium* tubulosum, 3-partitum, laciniis induplicato-valvatis. *Columna* staminea 3-loba. *Antheræ* indefinitæ, hippocrepicè curvatæ insuper lobos columnæ. *Pollen* simplex. *Ovarium* inferum, uniloculare; stylus subnullus; stigma discoideum, 3-lobum, e lamellis plurimis in placentas totidem pendulas, undique ovuliferas, productis. *Fructus* (granatiformis) baccatus, 1-locularis, placentis undique seminiferis pendulis repletus.

Plantæ *Capenses, e solo flore et axi brevi constantes, radicum* Euphorbiarum et Cotyledonis orbiculatæ *parasiticæ.* Flos *amplus, roseo-sanguineus, odore carnis putrescentis.* Perianthii *laciniæ secus induplicationes, præsertim versus margines, ramentacei, apice sæpè cohærentes, intùs supra medium* (*saltèm in alabastro*) *lobo pulvinato sessili auctæ.* Columnæ stamineæ *et* stigmatis *lobi perianthii laciniis oppositi.* Stigma *oculo nudo striatum.* Seminum *tegumenta bina; exterius tenuissimum albidum cellulosum; interius subcrustaceum, brunneum.* Embryo *liber, semini conformis, albuminiformis, cereo-cellulosus, cellulis e centro* (*cavo*) (*an semper?*) *radiantibus, farctis moleculis et materie oleaginosâ.*

Hydnora Africana, Thunb. Meyer, Nov. Act. Natur. Curios. vol. xvi. p. 775. t. 58. (mala).

Aphyteia Hydnora, *Linn. Amœn. Academ.* viii. 310. *Harvey, Genera South African Pl.* p. 299.

OBS. I.—I have examined specimens of *Hydnora africana*, both in the dry state and preserved in pyroligneous acid, communicated by Mr. Harvey.

As *Hydnora africana* appears tolerably well known, I have not given a detailed description; and it is with some hesitation that I have ventured on laying before the Society my views of a plant, which has formed part of a subject treated by Mr. Brown, and illustrated by one of the incomparable Bauers.

As all the flowers and buds were detached from the stems, I have not remarked upon the latter, more particularly as they appeared to me too perfectly organized for the plants, and besides presented curious resemblances to what

might be, perhaps, supposed to be the structure of the *Euphorbiæ*, on which they grow.

Obs. II.—Of the few descriptions I have been able to consult, that of Mr. Harvey, who has noticed the relations of the placentæ with the lamellæ of the stigma, agrees best with the appearances presented by my specimens.

M. Endlicher's account, which is much the same as that of Sprengel*, who referred the genus to *Monadelphia Triandria*, and doubtfully to *Cacti*! of Jussieu, who took his from Linnæus's Supplement, adding one of his extraordinary sagacious questions regarding its affinity to *Cytineæ*, differs considerably. He considers the male apparatus as consisting of three stamina with multilocular anthers, a structure, as it appears to me, quite at variance with the appearances in my specimens. It is also, I think, contrary to analogy, no instance being I believe known of a single anther consisting of an indefinite number of regular cells, each of which has its own distinct superficies and dehiscence. In all cases, not arising from the union of two or more stamina, in which the number of loculi is increased, it arises, or appears to do so, from the subdivision of the ordinary quadrilocellar theca; and in all such the dehiscence appears to become more or less disturbed, in some being contracted to a common point, as in *Rafflesia*; in others being partially extended, so that each *locellus* has its proper dehiscence, as in *Viscum*; in others being generally extended, so as to cause the separation of the whole or greater part of the superficies of the body of the anther, as in *Rhizophora*. The indefiniteness of the anthers is likewise, I think, to be inferred from the occasional existence of what may be termed supplemental anthers, and also from the structure of *Cytinus*. It must however be kept in mind, that Mr. Brown may be supposed to have entertained a similar view from the nature of his remarks on the affinity of *Aphyteia* with *Curcubitaceæ*. It appears to me, nevertheless, that to constitute an affinity in structure between the anthers of *Hydnora* and of some *Cucurbitaceæ*, a certain amount of continuity of some of the cells of each lobe of the column of *Hydnora* would be requisite†. The structure of

* Genera Plantarum, ii. 526. no. 2585.

† On such a point as this I would express myself with the greatest diffidence, being quite aware of the immense knowledge required to be able to thoroughly understand the remarks of Mr. Robert Brown.

the anthers suggests the probability that the mechanical means for promoting dehiscence are confined to the middle, not as they very generally are, to the inner tissue.

Neither Mr. Harvey nor M. Endlicher has noticed the remarkable structure of the stigma, either as regards its striate appearance, arising from its lamellate composition, or the very evident definite grouping of the lamellæ. Possibly in the state of nature both of these are concealed by stigmatic secretion, or by a particular state of the tissue disappearing on maceration. The apparent opposition of its lobes to the lobes of the staminal column does not appear to have been noticed.

The observations I have made on the placentation do not entirely agree with those of M. Endlicher, who has described the placentæ as being parietal in the unfecundated state of the ovarium*. In my specimens, which embrace a considerable range of development, they have always appeared to me to be free and pendulous, bearing ovula over their whole surface; and this agrees with the observations of Mr. Harvey. The determination of this is of some importance, since if the placentæ are free and pendulous throughout, another objection appears to me presented to the placentary hypothesis of M. Schleiden.

The antitropous nature of the ovula, although sufficiently obvious in the earlier stages of their development, soon ceases to be discernible even under pressure.

Obs. III.—So far as my experience goes, the vegetable kingdom does not present a more complex or anomalous instance of the structure of the pistillum. Considered as an instance of multicarpellary structure, the stigma appears to admit of satisfactory explanation, and to be analogous to the stigmata of *Papaver* and *Nymphæa*; the space between each lamella corresponding with a carpellary leaf, and each lamella itself being compound, as almost always happens in such instances. This would be in my opinion the obvious structure, should M. Endlicher's observations regarding the placentæ of the unimpregnated ovarium being parietal prove to be correct†. But the evident

* Genera Plantarum, p. 75, in the observation.

† It may be gathered, perhaps, from Mr. Brown's remarks on the occasional limitation of the placenta to the apex of the cell of the carpellary leaf, that he thinks it probable that *Hydnora* is multicarpellary.—See 'Plantæ Javanicæ Rariores,' part ii. p. 109.

ternary grouping of the plates of the stigma, the evident, though in a much smaller degree, ternary division of the inner surface of the ovarium, and the general structure of the flower and its affinities, all militate in a greater or less degree against this supposition; and if Mr. Harvey's and my own observations be found to be correct, we are compelled, I think, to admit that the composition of the pistillum is definite. In this case the hypothetical explanation becomes exceedingly complex, and perhaps paradoxical, when I consider the simple state in which the vegetable leaf is generally presented to us in the pistillum.

Hydnora appears to me much more perfect (complex) in its organization than *Cytinus*. It is also remarkable for being hermaphrodite, and for presenting, excepting those parts of the anthers on the outer face of the *columna staminea*, perhaps the greatest known facilities for impregnation*.

Cytinus, *Jussieu, Gen. Plant.* p. 73. *Endl. Gen. Pl.* p. 75, 723.

Hypolepis, Spr. Gen. Pl. 11. no. (38.) (char. pessimo). Harv. Gen. S. African Plants, 300. Brongniart, Ann. Sc. Nat. i. p. 40. t. 4.

Char. Gen. *Flores* monoici vel dioici. Mas. *Perianthium* duplici serie 4–6-partitum, æstivatione imbricatum. *Stamina* monadelpha 7–8 (vel 14–16); antheræ lineares, rectæ, adnatæ, coronulâ lobatâ dentatâ terminatæ. Rudimentum *Pistilli* nullum. Fœm. *Perianthium* maris. *Ovarium* inferum, 1-loculare; placentæ plures parietales; ovula

* On my arrival at the Botanic Gardens several months after the above, with the exception of one or two of the notes, was written, I had an opportunity of consulting M. Meyer's description of *Hydnora africana* and *H. triceps* in the 'Nova Acta Physico-Medica,' &c., vol. xvi. p. 773. M. Meyer describes the stamina as indefinite, the anthers as dithecous, the stigma as trilobed, as having a striate appearance, and as opposite to the lobes of the *columna staminea* and to the segments of the perianth, and the placentæ as being pendulous from the stigma-bearing disc. He also seems to be of opinion that three ovaria enter into the composition of its pistillum. He alludes to Mr. Brown's remarks on the affinity in the structure of the anthers of *Hydnora* and those of *Cucurbitaceæ*, and appears to think that Mr. Brown may have been misled by Thunberg's description, since he finds the structure of the anthers of *Hydnora* extremely different from the flexuose ones of *Cucurbitaceæ*. He suggests the probability of the processes on the inner faces of the laciniæ of the perianth (*pulvini*), the petals of Thunberg, being the rudiments of an inner series: this, it appears to me, would either increase the degree of opposition, or require a paradoxical hypothesis regarding the composition of the outer laciniæ. Lastly, M. Meyer denies that it has any affinity with *Fungi*, and places it among *Asarineæ*, believing it to have albuminous, embryonate seeds.

antitropa; stylus columnaris; stigma globoso-capitatum (e lamellis liberis tot quot placentæ parietales formatum). *Fructus* . . . . . .

Herbæ *parasiticæ; squamis imbricatis loco foliorum.* Flores *solitarii, congesti, colorati, tribracteati; bracteis* 2 *interioribus perianthii basi adnatis.* Pollen *compositum.*

Cytinus dioicus, Jussieu, Ann. du Muséum, xii. 443.

Phelypæa sanguinea, *Thunberg, Nov. Gen. Plant.* v. pp. 91–93?

Hypolepis sanguinea, *Pers. Syn. Plant.* ii. 598? *Harv. Gen. S. African Plants*, 300.

Descr. Caulis brevis, 4 6-uncialis; squamæ (folia) oblongæ, laxiusculè imbricatæ, margine membranaceæ, denticulatæ, interdùm subcarinatæ. Ramuli congesti, uniflori, squamis similibus imbricati. Bracteæ cujuscunque floris 3, duæ interiores laterales et oppositæ. Flores dioici, terminales, majusculi. Masculi infundibuliformes; tubus profundè 6-sulcatus, sulcis cum laciniis alternantibus; lamina erecto-connivens imbricata, 6-partita; laciniæ concavæ, oblongæ, margine membranaceæ, fimbriatulæ, basi tubi exceptâ processubus papillosis extùs vestitæ. Adsunt aliquando lacinulæ lineari-lanceolatæ ad latus unum alterumve laciniarum. Tubus infra basin columnæ intùs quasi 6-locularis (ob inflexuram et coalitionem laciniarum sepalorumve cum columnâ), circa basin partis liberæ columnæ processubus magìs evolutis densè vestitus. Columna (libera) brevis, e fauce quasi exserta, sulcis tot quot loculi exarata, glabra. Antheræ 7–8 (vel 14–16), terminales, lineares, adnatæ, biloculares; extrorsæ; connectiva in dentes mucronesve subpatentes, in formâ coronulæ dispositos, producta. Pollen ter- vel quater-narium. Rudimentum fœminæ nullum. *Fœm.* Perianthium maris, sed minùs infundibuliforme; tubus latior magìsque costatus, laciniæque latiores at breviores. Columna (libera) masculinæ satis similis, lævis, basin versus pubescens, terminata stigmate magno, globoso-capitato, e lamellis 12–14 cuneato-subulatis, densè papillosis. Ovarium omninò inferum, 1-loculare, compressum, extùs, basi exceptâ, (ob costas perianthii) 6-costatum vel 6-angulatum. Placentæ parietales 12–14, tot quot stigmatis lamellæ. Ovula innumera, minuta, antitropa, placentis undique affixa. Fructus non visus.

Hab. "Parasitica in *Eriocephali racemosi* radicibus, ad C. B. S." *D. Harvey**.

Obs. I.—The axis of this plant consists chiefly of roundish cellular tissue, towards the middle of which there is a simple series of vascular fascicles; the transverse section of these is cuneate or subovate, the narrow end, and this is

* Mr. Harvey tells me he has always found this plant on the above Syngenesious species, which does not appear to suffer from being preyed upon. The same innocuousness has, I believe, been remarked of *C. Hypocistis*.

the most opake part, being next the axis. There is no distinction of pith, medulla or bark.

In the fascicles vessels are very abundant, preponderating over the fibres; they are ducts, and are here and there unrollable. Vessels of a similar nature, but smaller and with a less approximate fibre, occur in the fascicles of the laciniæ of the perianth, which have a dicotyledonous venation. The parasitism appears to be analogous to that of some species of *Orobanche*.

OBS. II.—The specimens I have examined do not agree very well with the character of *Cytinus* given by Endlicher*, who has adopted the suggestion of Jussieu regarding the generic identity of Thunberg's *Phelypæa* with *Cytinus*. In this combination of the Cape and European plants, Mr. Harvey is fully disposed to concur. M. Endlicher describes the genus as monoicous, as having the stamina double in number to the laciniæ of the perianth, and the placentæ as eight in number.

Other differences depend upon the opinion formed of the nature of the parts. M. Endlicher, following Jussieu and M. Brongniart†, considers the filaments (or *synema*) as being connate with the rudiments of the styles, and the anthers as connate "*in capitulum stigmatum rudimentis superatum*." This view agrees at first sight with the appearances presented by the column of *Thottea* and *Asiphonia*, and perhaps with those presented by the vascular apparatus of the male column. Nevertheless, I would rather consider the terminal teeth or lobes of the staminal column, as Mr. Harvey indeed has done, to be productions of the *connectiva* beyond the *loculi* of the anthers, with which they have, so far as I have been able to judge, a determinate relation both as to number and continuity. And perhaps the complete separation of the sexes is further pointed out by the absence of rudimentary stamina from the female column, a circumstance which does not obtain in *Sapria* or *Brugmansia*. To this however the obvious hermaphroditism of the flowers of *Hydnora* may, perhaps, be opposed.

OBS. III.—This is one of those instances in which there is, I think, difficulty

* *Loc. cit.*

† Ann. Sc. Nat. i. 29. t. 4. The figure by M. Brongniart certainly presents an appearance as if the apex of the staminal column was crowned by irregular teeth in two series. On the other hand, in Hooker's illustrations of *C. Hypocistis* (Exotic Flora, t. 153.) each anther is clearly represented as terminated by a tooth, without any appearance of a crown, as suggested by the description of M. Brongniart.

in determining from mature specimens whether the anthers are uni- or bilocular, admitting the term bilocularity as it is commonly used. For, though the appearance of the apex of the male column, especially of the inner faces of its teeth or lobes (which are by no means always emarginate), is in favour of the anthers being bilocular, yet the furrows visible on the column are equal in number to the loculi; and the disposition of the vessels that appear to belong more directly to the stamina is also that which ordinarily, I think, obtains with unilocular anthers. The same, perhaps, may be said of the appearances presented by a transverse section of the antheriferous part of the column.

Obs. IV.—The stigmatic tissues are highly developed, consisting of very long, nucleary cells, arranged over the whole surface of each lobe of the framework, as it may be called, each of which communicates freely with the canal of communication. In this part of its organization this species presents curious analogies with *Euhalus*. Jussieu suggests an affinity with *Hydrocharideæ*, op. cit. p. 73. in observ.

The structure of the ovula with reference to the direction of the apex of the nucleus is only determinable in my specimens at a very early period, when the prominence of the nucleus on the same line with the ovulum and funiculus is easily observable. This prominence soon disappears, the mature ovula looking like clavate truncate bodies. Of their internal structure I ascertained nothing; nor was I able to satisfy myself of any separation whatever of parts.

§ 4. Asarineæ.

Thottea, *Rottb. in Dansk. Vidensk. Selsk. Schrift. nye Saml.* ii. 530. t. 2. *ex Endl. Gen. Plant.* 345. no. 2164.

Perianthium campanulatum, æquale, 3-partitum. *Stamina* circiter 35, biseriatim circa columnam verticillata. *Ovarium* 4-loculare; stigma discoideum stellato-lobatum. *Fructus* siliquiformis, 4-valvis, filis repliformibus totidem interjectis. *Placenta* libera, tetragona. *Semina* uniseriata, rugoso-papillosa.

Frutex *humilis, aromate et habitu Anonaceo.* Folia *magna, oblonga.* Racemi *e caulis parte inferiore foliis denudatâ.* Flores *amplissimi, penduli, conspicuè venosi, extùs hamoso-strigosi, intùs arachnoidei.*

Thottea grandiflora, Rottb., *loc. cit.*

Descr. Frutex 3–4-pedalis, satis robustus, apice parcè ramosus; ramulis pubescentibus.

Folia magna, alterna, exstipulata, oblonga, vel obovato-oblonga, subdisticha, ob dispositionem et magnitudinem racemos sæpè omninò ferè obtegentia, coriacea, obtusè et brevè cuspidata, brevè petiolata, subtùs densè pubescenti-hirta (venulis ultimis etiam subtùs elevatis), superiora majora. Racemi pauciflori, ex axillis foliorum lapsorum, 2–3-unciales, nutantes, pubescenti-hirti. Bracteæ distichæ, lineari-oblongæ, subcarinatæ. Flores amplissimi, penduli, longitudine ferè 5-unciales, latitudine extremâ 4-unciales, extùs insigniter costato-venosi, hamoso-strigosi; colore luridè purpureo, interveniis irregulariter albo maculatis; intùs purpurei, indumento arachnoideo azureo flocculenti. Perianthium campanulatum, submembranaceum, ad medium vix 3-partitum; laciniæ margine revolutæ, æstivatione valvatæ, apice subintroflexæ. Alabastra inflata. Genitalia in fundo imo perianthii nidulantia. Columna brevissima, seriebus binis staminum verticillatorum circumdata, apice radiatim vel stellatim lobata. Staminum filamenta brevissima; antheræ adnatæ, extrorsæ, biloculares, longitudinaliter dehiscentes, seriei inferioris circiter 18, superioris et suboppositæ circiter 16. Pollen oblongum, in aquâ punctulatum. Ovarium rotundatè 4-angulatum, densè hispidum, 4-loculare; placenta cruciata, cruribus cum angulis ovarii alternis; ovula pauca pendula. Stylus liber subnullus. Stigma (vel apex radiato-lobatus columnæ) sub 13-partitum, convexiusculum, radiis (primariis) fundi quatuor cruciatim dispositis. Fructus siliquiformis, 4–6-uncialis, utrinque subattenuatus, breviter pedicellatus, subtortus, subtorulosus, 4-angulatus, pube brunneâ asper, 4-valvis; valvis canaliculatis, extùs carinato-costatis, leviter tortis; interjectis filamentis totidem repliformibus. Placenta carnosa, 4-gona, libera. Semina anatropa, pauca, oblongo-ovata, in concavitatibus placentæ liberæ seminidulantia, pendula, uniseriata, angulis placentæ affixa. Tegumentum exterius spongioso-cellulosum, superficie irregulari; internum induratum, subosseum, superficie undulatum, brunneum, intùs nitidum. Albumen carnosum, copiosum, cavitati tegumenti interioris conforme. Embryo minimus, basilaris, ovatus, dicotyledoneus; radicula versus hilum.

Obs. I.—My first acquaintance with this plant is due to Lady Norris, to whom it was brought at Ayer Punnus, while Sir William Norris and myself were absent at Mount Ophir. The first European however who seems to have met with it since Kœnig is the Rev. Mr. White, chaplain at Singapore, whose specimens, consisting of a leaf, a flower, and portion of a stem with racemes, had been seen by Dr. Wallich; the envelope bearing the following in that botanist's hand-writing:—"Perhaps an *Anonacea*. Can it be one of the superb *Magnoliaceæ* to which Blume refers?" Subsequently I ascertained it to be abundant throughout the Great Forest of the Malacca district,

to which however it is not confined, occurring abundantly in the smaller jungle about Pringitt, the place from which Kœnig seems to have obtained his specimens*.

It is a remarkable as well as an ornamental plant, although the flowers are in a great measure concealed by the leaves. I refer it without doubt to *Thottea grandiflora*, Rottb., from one of its localities, and from the descriptions contained in M. Meyer's account of *Hydnora*†, and in Endlicher's 'Genera'‡.

Obs. II.—There is no genus of *Asarineæ* with which it is likely to be confounded while in flower, it being the only one with indefinite biseriate stamina. In the structure of its stigma it essentially agrees with *Asiphonia*, as well as in that of the fruit and seeds. It is the only species with a regular perianthium that has a tendency to rival in size the flowers of some Aristolochias. The stigma preserves in a great degree the remarkable disposition, characteristic of part of the family, to show little correspondence in number of divisions with the component parts of the ovarium; a subject on which I propose to enter at some length.

In connexion with the stigma of this plant and that of *Asiphonia*, a few remarks upon that organ may perhaps not be misplaced.

All the definitions of this organ, in the works quoted in the note§, the only ones I have access to, refer to its papillose or glandular nature, and regard it as forming part of the style, of which also most regard it as the termination.

The constant referring of the stigma to the style has caused certain contradictions, inasmuch as none of the authors of the definitions consider the style to be an essential organ. In like manner, its being constantly considered as of a papillose or secretory nature may be considered as contradicted when it is referred to the apex of the midrib‖, which may be assumed as belonging to the densest part of the whole structure of the leaf, and which besides has no

* Pl. Jav. Rarior. part 1. p. 45. in a note.

† Nov. Act. Acad. Nat. Curios. tom. xvi. p. 785. ‡ *Loc. cit.*

§ Link, Philos. Bot. p. 306. DeCand., Théorie Élém. p. 401; Organographie, i. 479. Lindley, Outlines, no. 345; Key, p. 27. nos. 345–350, p. 28. no. 358; Introd., 2nd ed. p. 196.

‖ This origin, from the assumption of the accuracy of which the opposition of the stigmata to the placentæ has been so much insisted on, is disproved by *Nymphæa*, *Apocyneæ*, *Asclepiadeæ*, *Linaria purpurea*, some *Thunbergiæ*, &c.

necessary relation with the cavity of the ovarium, or in the great generality of cases with the placentæ.

Although that definition which regards its secretory nature is the most correct, it is not sufficiently so; that which regards it as terminating the style is often contradicted; and even setting aside such exceptions as must arise from the not unfrequent absence of a style, it would not by any means be always correct when that part of the pistillum does exist.

M. Schleiden* has made an improvement in defining this organ, and, taken with the context, his definition appears to me to be tolerably complete both as regards situation and function. Nevertheless, in the actual definition the stigma is still referred to the style.

In my opinion the stigma is better defined as the external communication of the conducting tissue, which itself communicates with the placentæ, and is, in several cases at least, (as in *Trewia nudiflora*,) manifestly a continuation from them. To this Dr. Lindley would appear to have approached in some remarks on *Fabiana imbricata*†, but he has considered it a special, not a general structure. If the expression I have made use of above as describing in general terms the stigma be correct, its situation may be totally independent of the style, even when it exists, or what may be considered as such. This I believe will be found to be the case.

Of the theoretical origin of the stigma‡ I would speak with caution. In

* "On the Development of the Organization in Phænogamous Plants," Lond. and Edinb. Phil. Mag. vol. xii. p. 182.

† Bot. Register, vol. xxv. t. 59. Dr. Lindley is correct in stating the indusium to belong to the style, as I have ascertained from studying its development in *Scævola Taccada*.

‡ In a memoir on *Cyrtandraceæ* by Mr. Robert Brown[1], with which I became acquainted several months after this was written, the following opinions regarding the stigma are given:—

"Each simple pistillum or carpel has necessarily two stigmata, which are to be regarded not as terminal, but lateral."

"In the compound but unilocular ovarium, while the placentæ of the adjoining carpels are united, the stigmata of each carpel are generally confluent. But this rule admits of exceptions, as in *Parnassia*, in many *Cruciferæ* and in *Papaveraceæ*; in all these cases the stigmata as well as the placentæ of the adjoining carpels are confluent."

"Characters dependent on the various modifications of stigmata are of less value, both in a systematic

[1] Pl. Javan. Rarior. part 11. p. 106, under *Loxonia acuminata*.

two distinct cases of monstrosities affecting two Leguminous plants, both, I believe, species of *Melilotus*, the stigmatic surface is evidently a continuation

---

point of view, as determining the limits of families, and theoretically, in ascertaining the true composition of organs, than those derived from the analogous differences in the ovaria or placentæ."

This paper I may be permitted to consider as of the highest importance, more particularly as it advocates the opinion that "ovula belong to the transformed leaf or carpel, and are not derived from processes of the axis united with it, as several eminent botanists have lately supposed;" which opinion M. Schleiden, with whom the hypothesis of the origin from the axis commenced, has stated to be an "extravagant view founded on the weakest possible grounds."

Forcible arguments are added to those formerly published by the same great master in opposition to the hypothesis now chiefly supported by Dr. Lindley of the carpellary structure of *Orchideæ*, which hypothesis is clearly shown to be contrary to *every* analogy.

The only argument in favour of the existence of six carpella in *Orchideæ*, but by no means in favour of the above hypothesis, seems to me that presented by *Vanilla planifolia*, as represented by Mr. Francis Bauer[1], in which the appearances seem to me those of an unilocular pistillum composed of six carpella with marginal ordinarily compound placentæ. This structure however does not exist in a Malayan undescribed species, the only one I have been able to examine[2], in which there are six simple placentæ, with a tendency to approximation by pairs. This separation of the placentæ, so generally combined in compound pairs, I would explain by assuming a certain amount of growth of the interplacentar parts of the compound ovarium, an assumption perhaps derivable from the consideration of *Euhalus* and certain *Orobancheæ*. Among the drawings in the Botanic Garden, I find a sketch of an Orobancheous plant (without name or any clue to what it may be), in which the appearances are exactly those of an unilocular quadricarpellary ovarium.

Mr. Brown's paper may be considered as disposing finally of many of the apparently anomalous cases, whether the supposed anomaly has been suggested by the examination of the stigma or ovarium. His explanation of *Cruciferæ* is, in accordance with his previous ideas, extended to the stigma, perhaps to account for its opposition to the placentæ, on which great stress had been laid. The few observations I have made on one genus only of this family appear to me to indicate the probability, that in some genera, at least, the pistillum is composed of four carpella; the stigmata of each of the anterior and posterior carpella (which subsequently are much the smallest) being confluent, and also cohering with the stigmata of the lateral carpella, which are individually otherwise distinct. This structure, so far as the pistillum is concerned, is analogous in a considerable degree to that of *Chryseis*. The above explanation, founded on a solitary instance, is independent of that by Professor Lindley, suggested by the plant just mentioned[3], in which the anomaly is assumed to exist from the opposition of the stigmata to the placentæ, which is, I believe, their true theoretical situation.

The apparently anomalous structure of *Cucurbitaceæ*, to which notice has been lately directed by

---

[1] Gen. Sp. Orchid. part 3. t. 10.

[2] I have since examined one ovarium of *Vanilla planifolia*, and this specimen did not present to me appearances different in any important degree from those of the Malacca plants.

[3] Bot. Register, t. 1168, sub *Eschscholtzia californica*.

of the placental margins of the carpellum. Such an origin is very compatible with the appearances of many linear stigmata, which present a sulcus along the centre; with those of some monocarpellary *Urticeæ*, which have two obvious stigmata; and indeed, admitting degrees of cohesion by no means unusual in other parts of the flower, may be extended perhaps to all the stigmata I have examined.

M. Schleiden* would appear to refer the origin of the conducting tissue to the epidermis of the upper surface of the leaf.

From the stigma having been generally found to present definite relations with the style of its carpellum, has arisen its importance in determining the composition of the compound ovarium. But these ordinary relations, from which alone its practical character arises, may be obscured by several causes; as the separation of parts usually cohering; the cohesion of parts ordinarily distinct; the division of the merely stigmatic part of each style; the division of the style of the simple carpellum.

The stigmata of each carpellum may be distinct from each other, or from those of the next carpella. The only strong tendency to this, I know of, occurs in *Euhalus*, in which the distinction of the stigmata is accompanied by a distinction of the placentæ. The result is obvious if applied to a multilocular compound pistillum.

Many botanists appear to me to have lost sight of the possibility of an adhesion taking place between stigmatic surfaces ordinarily distinct, similar to that which is considered to cause the loculicidal dehiscence of fruits; whereby the stigmata, so resulting, instead of having an obvious correspondence with the dorsa of the styles, appear actually to alternate with them. Such an ex-

---

Dr. Wight[1], is not alluded to by Mr. Brown. Dr. Wight's hypothesis does not appear to me to be tenable; for it reverses, without any ascribed cause, the very general law regarding the relations of the surface of the lamina of the leaf to the axis. It is also, I think, contradicted by the examination of the very young states of the ovarium of *Coccinea indica*, in which there are evidently three ordinarily compound parietal placentæ, and also by the placentation of the fully-formed ovarium of *Zanonia*, the structure of which appears to me to be conclusive on this point.

* *Op. cit.* p. 183.

[1] Madras Journal of Literature and Science, no. 28, 1840, p. 43.

ample occurs in *Orobanche**, as may be ascertained by the examination of the stigma at very early periods, and of the situation of the vascular bundles of the style, which are anterior and posterior, as in all the allied genera I have examined. A similar sort of cohesion occurs in *Papaveraceæ*, and perhaps in all cases in which the stigmata, being apparently equal in number to the placentæ, are said to be opposite to them. On this point, the stigmata of *Linaria purpurea* and *Thunbergia alata* (*alba*), bear with considerable force†.

The stigmatic surfaces may be divided without any particular reference to the state of the styles or composition of the ovarium. Of this, *Acalypha* and the two genera which have induced these observations are instances in excess. Some species of *Bragantia*, on the contrary, appear to present only three styles to four carpella. And I think it may be said, that the stigma, being an extension of or continuation from cellular surfaces, frequently of very irregular growth, is not to be expected to present a constantly definable form‡.

* Regarding this I can speak with such confidence as I may, when Dr. Lindley has expressed himself positively to the contrary; and has, from the consideration of *Orobancheæ*, so extended the possible origin of the placentæ, that he conceives these organs to arise from no definite portion of the carpellum, but to vary in origin according to specific organization. (Introd. to Botany, 2nd ed. p. 203.)

† These instances also bear on Dr. Lindley's supposition regarding the composition of the "intervening web or membrane" of the stigmatic apparatus of *Habenaria*, *Bonatea*, &c. (Gen. Sp. Orchid. Pl., Preface, xi.)

‡ In all cases in which stigmata are to be observed with reference to the composition of the ovarium, I have, I think, derived advantage from the examination of their surfaces, their vascular supply, and its connexion with that of the style and ovarium. If the stigmatic divisions have both surfaces uniformly stigmatic, still more if they present no vascular fascicle, I take them to be stigmata alone.

On the contrary, the circumstances of their outer surfaces or dorsa not being entirely stigmatic, and the presence of vessels, which, so far as I have seen, have a clavate termination, applied to cases described as *stigma bifidum*, *bilamellatum*, &c., will show that these terms of division have reference to the style. They will also I think show, that many of the *Euphorbiaceæ* cited by Schleiden as having stigmata only, possess bipartite styles; that styles exist in some *Gramineæ* at least; and that in *Compositæ* the term *rami styli* is more correct than that of *stigma bilobum*.

In those cases in which the stigmatic surfaces are simple and really confined to the style of the same carpellary leaf, the form of the stigma will generally depend in a great measure upon the extent to which the convolution of that part of the carpellary leaf (generally a cuspis) which forms the style is carried. If the convolution be complete, presenting an equal margin, we have a terminal stigma without any sinus, as in many *Leguminosæ*, *Mirabilis*, &c. If the convolution is less complete, we may have a reniform stigma or one of any discoid form with at least an anterior or inferior sinus, and according as

The styles of a compound pistillum may be themselves divided, as in *Cordia*, some *Verbenaceæ*, and many *Euphorbiaceæ*. In these instances, if the stigmata were taken as guides, the ovarium would be considered as composed of twice the real number of parts. In such cases regard should be paid, in my opinion, to the primary divisions or indications of division of the style, the situation of the vascular fascicles and their relations with those of the ovarium, and also to the relative situation of the secondary divisions. This last, which is very applicable to *Cordia*, is, I think, negatived by one species at least of *Artocarpus*, in which however the opposition of the two stigmata may perhaps not improperly be referred to mechanical causes.

Further obscurities may arise from the stigmata, instead of having their usual relations with the styles of a compound ovarium, being confined to a part of these lower than usual, and from these partial stigmata coalescing, as in many *Apocyneæ*, in which an annulus of stigmatic surface is exhibited surmounted by an *apiculus*. Something of the same kind, though in a much more obscure degree, is presented by the stigma of most *Asclepiadeæ*, whether it be described as *apiculatum* or *muticum*. It is also to be met with in some *Meliaceæ* and in *Heliotropium*.

The sources of obscurity affecting the stigma not unfrequently affect the style, so that no absolute rule applicable to the style of a compound ovarium drawn from its perfect state can be opposed to the speculations of the theoretical botanist regarding certain anomalies. In all such the examination must be carried back to that early period when the disc or mass of cellular tissue, from which the various parts are first moulded, presents the carpella in the shape of so many distinct points.

It rarely happens however that the obscuring causes, existing in the mature flower, affect equally all the component parts of a pistillum, each of which should be examined in detail. The examination should be extended to the allied genera. Such rules applied to *Punica* go far enough to invalidate the

---

the convolution becomes less we shall have corresponding varieties of elongated, linear or spathulate stigmata.

Although the convolution by which the style is formed is generally most complete in the direction of the ovarium itself, yet in compound styles the reverse is sometimes the case, as in *Gmelina*, in which the branches of the style are perfectly convolute, while the style itself presents one common canal.

hypothesis of Dr. Lindley regarding the structure of its pistillum, and to establish, perhaps, the fact that the pistillum of *Punica* is, at least in its early stages, as definitely compound as that of *Sonneratia* and *Duabanga*, with which it appears to me to form a natural family intermediate between *Lythrarieæ* and *Myrtaceæ*. Its anomalies, which are remarkable, may probably be explained by due consideration of the empty space found in the axis of the ovarium of *Duabanga*, and by the placentation of *Pternandra*.

I believe that simplicity and precision would be attained by abandoning the use of the term stigma, and by describing it as the stigmatic surface or surfaces. No term is at present more frequently misapplied; see, for instance, *Tacca*; and even amended descriptions, as that of Mr. Bentham* regarding the stigma of *Labiatæ*, are not always as correct as they might be.

Obs. III.—I am not aware whether in the original description of this plant any mention is made of the repliform lines; nor am I sure that these become constantly separated. They alternate with the valves, and correspond in situation with the vascular bundles of the angles of the cruciform placenta of the ovarium, a body very different in appearance from the rest of that organ.

Asiphonia.

Char. Gen. *Perianthium* æquale, rotatum, tripartitum, tubo nullo. *Stamina* 8–10, uniseriata (filamentis nullis). *Stigma* discoideum, sinuoso-lobatum. *Pericarpium* siliquiforme, 4-loculare, 4-valve, polyspermum. *Semina* trigona, rugoso-papillosa.

Frutex *subscandens, facie Piperis fruticosæ cujusdam, articulis tumidis.* Folia *venatione melastomaceo-piperoideâ.* Corymbus *terminalis.* Spicis *paucifloris*; floribus *sursùm secundis, bibracteolatis.*

Asiphonia piperiformis.

Descr. Frutex vagus, subscandens, odore piperaceo. Rami articulati, ad articulos incrassati. Folia alterna, vel distichè subpatentia, vel sæpiùs subpendula, brevè petiolata, e basi ovata vel subcordata oblonga, acuminatissima, integra, subtùs pubescentia, basi 5-venia; venæ 2 laterales evanidæ, cum lateralibus exterioribus venarum intermediarum citò confluentes: 2 intermediæ apicem versus cum secundariis venæ primariæ (costæ) arcuato-anastomosantes: interveniæ cæterùm transversè venulosæ, interstitiis reticulatis. Inflorescentia cymoso-corymbosa, terminalis et ex axillâ folii ultimi. Spicæ incrassatæ. Flores subspicati, sursùm subsecundi, erecti, inconspicui, initio viridescentes, demùm

* Lindley, Introd. Nat. Syst. p. 196.

purpurascentes vel livido-plumbei, bracteis 2 minutis linearibus setaceis lateralibus stipati. Perianthium carnosum, rotatum; tubus nullus, perianthii basi nempè planissimâ, laciniæ (vel sepala) 3, cordata, acuta, intùs subreticulata, extùs pubescentia. Alabastrum vertice depresso-concavum, ambitu obsoletè 3-gonum. Stamina 8–10, uniseriata. Filamenta nulla. Antheræ biloculares, extrorsæ, subcordatæ, connectivo magno glanduloso-pubescente, quasi conduplicato; loculi distantes, lineares, longitudinaliter dehiscentes. Pollen granulosum, granulis in aquâ deciduis. Ovarium breviter pedicellatum, rotundato-tetragonum, densè pubescenti-hirtum, 4-loculare; loculi minuti cum angulis respondentes; placentæ cruciatæ, in centro cohærentes; ovula indefinitè numerosa, anatropa, biseriata, minuta; stylus nullus; stigma centrum genitalium disci implens, lobato-sinuosum. Fructus siliquiformis, 4–6-uncialis, pendulus, subtorulosus, stipitatus, 4-valvis, pubescenti-velutinus. Placenta libera, centralis, 4-gona. Semina vel valvis adhærentia, vel inter angulos placentæ ferè immersa, sæpè monile instar leviter cohærentia, uniseriata, trigona, apice et basi et secus angulum tertium internum sæpè membranaceo-alata, rugosa, papillosa, grisea, imperfecta tantum observata. Tegumentum exterius crassiusculum, crustaceum; superficies utraque saltem rugosa: interius (sacculus embryonarius?) membranaceo-cellulosum, tenuissimum. Albumen ob imperfectionem? mancum, oleosum, carnosum. Embryo non observatus.

Hab. In provinciâ Malacca peninsulæ Malayanæ, ad margines sylvarum primævarum; copiosè versus Ayer Punnus Rhim. Floret per menses calidiores.

Obs. I.—The wood consists of a largish pith, and narrow, wedge-shaped radiating masses of wood, separated by conspicuous medullary rays. The fibres of the woody system are not unfrequently punctate; the vessels present coniferous markings, often rendered less obscure by the enlargement of the central disc. The flowers are probably terminal, as there is no anticous bractea, and the two lateral ones often alternate.

Obs. II.—The flowers at first sight have a remarkable resemblance to the male flowers of *Knema*, a curious circumstance if combined with the Anonaceous habit of *Thottea*; and still more singular, perhaps, from the resemblance it presents in its own habit to certain forms of *Piper*.

Obs. III.—It is with some hesitation that I venture on proposing this as a genus distinct from *Bragantia*; for however different it may appear to be from *Bragantia tomentosa* and *B. Khasiyana*, it appears to have the closest affinities with the *Alpam* of the 'Hortus Malabaricus*,' which Mr. Bennett,

* *Op. cit.* vi. 51. t. 28.

in his excellent account of *Bragantia tomentosa**, states to be the *Bragantia Wallichii* of Mr. Brown. In default of intimate knowledge regarding this plant and the original species of Loureiro†, the stigma of which is described as "concavum, integrum, erectum," I have attempted to distinguish this plant by the absence of any tube to the perianth, the cordate sessile anthers, and the discoid sinuate-lobed stigma, in which it presents some agreement with *Thottea*. But whatever importance such a structure might be considered as having with reference to *Bragantia tomentosa* and *B. Khasiyana*, the circumstance of these species having only 3 stigmata to 4 cells of the ovarium argues a great tendency to variation, of which *Asiphonia* is only, perhaps, a maximum instance. On the form of the anthers I am not disposed to place any great reliance; and from Mr. Bennett's remarks, regarding the presence or absence of the annular corona of the faux, some tendency to variation would appear to occur in the perianthia of the several species, with which its state in this plant may not be incompatible.

In case it should be determined that *Asiphonia* is a subordinate modification of *Bragantia*, the character of the genus given by Mr. Bennett will require some modification, particularly as regards the stigma. The species might then be conveniently arranged as follows:

Sect. I.—*Frutices. Folia seriatim alternantia, spicæ axillares vel terminales, stamina* 6–9; to which should be added, if true of all, *Stigma discoideum, multi-lobatum.*

1. *Bragantia racemosa*, foliis latè lanceolatis, spicis axillaribus, tubo perianthii 10-sulcato, antheris sex.
   B. racemosa, *Lour. Fl. Cochin.* p. 508.
2. *B. Wallichii*, foliis elongato-lanceolatis, spicis axillaribus, floribus diclinibus, staminibus 9 subtriadelphis.
   B. Wallichii, *Br. in Wallich's List*, no. 7415. *Bennett, Pl. Jav. Rar.*, part 1. p. 44. Trimeriza piperina, *Lindl.* (*auct. Arnott ex Bennett*).
3. *B. corymbosa*, foliis e basi cordatâ acuminatissimis, spicis in corymbum terminalem dispositis, perianthii tubo nullo, antheris 8–10 obcordatis glanduloso-pubescentibus.
   Asiphonia piperiformis, *Griff.*

* Pl. Jav. Rarior. part 1. p. 44.

† Fl. Cochin. p. 508. ed. Willd. 645.

SECT. II.—*Herbæ vel suffrutices. Folia 2–3 ad apicem caulis conferta, spicæ in inferiori caulis parte laterales, stamina* 6, *stigmata* 3.

4. *B. tomentosa,* "foliis ovatis vel oblongo-ovatis, fauce perianthii annulo elevato cinctâ."

   B. tomentosa, *Bl. Bennett, Pl. Jav. Rar.* part 1. p. 43.

5. *B. Khasiyana,* foliis cordatis vel cordato-oblongis, spicis subrecurvis, perianthii laciniis dorso triveniis, fauce perianthii nudâ.

   Trichopus? piperifolius, *Wall.* (sine charactere).

   B. latifolia, *Lindl. Bot. Reg.*, n. s., vol. v. t. 1543, in text?

My only knowledge of this species is from a drawing in the Honourable Company's Library; the plant, I am told, came from the Khasiya Hills, but no dried specimens are to be found, nor any information.

§ 5. MYSTROPETALON.

MYSTROPETALON, *Harvey, Gen. S. Afr. Pl.* 418. *Ann. Nat. Hist.* no. 12. vol. ii. p. 385. *Endl. Gen. Pl. Suppl.* 717.

CHAR. GEN.—Mas. *Perianthium* trisepalum, sepala longè unguiculata, imâ basi connata apice dilatato-concava, æstivatione valvata, antico tertiò breviore. *Stamina* fertilia 2, sepalis posticis opposita, horumque unguibus adnata; *antheræ* biloculares, extrorsæ, longitudinaliter dehiscentes. Rudimentum *pistilli.* Fœm. *Perianthium* superum, sæpiùs minutum, tridentatum, aliquandò masculino subsimile et exsertum. *Staminum* rudimenta 2 vel 0. *Ovarium* disco cupuliformi celluloso-areolato insidens; *stylus* filiformis exsertus, deciduus; *stigma* capitatum, trilobum. *Fructus* disco immutato insidens, subbaccatus; tela centralis (embryo?) e cellulis angulatis lutescentibus conflata.

Plantæ *spithamææ parasiticæ.* Caules *squamis loco foliorum imbricatis vestiti.* Spicæ *solitariæ, terminales, densifloræ.* Flores *tribracteati, bracteis præsertim anticis barbato-villosis, masculi magis conspicui, deorsùm arcuati.* Perianthium *coriaceum.* Pollen *angulatum, angulis porosis.*

Mystropetalon Thomii, bracteis anticis per anthesin latè oblongis lateralibus $\frac{1}{3}$ longioribus, perianthii masculi laciniarum laminis lanceolatis; perianthio fœmineo subgloboso obtusè tridentato.

Mystropetalon Thomii, *Harvey, Gen. S. Afr. Pl.* p. 419. *Ann. Nat. Hist.* no. 12. vol. ii. p. 386. t. 19.

Hab. Caledon Baths, Swellendams, Africæ Australis. *D. Harvey.*

Planta digitalis vel subspithamæa. Axis cellulosa, cellulæ plerumque rubescentes; vasorum fasciculi plures, longitudinales, subbiseriati, e fibris ductubusque conflati. Cutis et medulla nulla. Folia decolorata, adpressa, e basi latiusculâ linearia, canaliculata, densè imbricata, præsertim infra spicam florum, plùs minùs pubescentia, speciminum fructiferorum sæpiùs transversè fracta; vena centralis unica. Flores subsessiles, densè spicati, tribracteati; fœminei inferiores, masculi superiores et pauciores. Bracteæ 2 laterales, obliquè carinatæ, subacutæ, hirtæ; antica $\frac{1}{3}$ longior, spathulata, hirta, apice barbato-villosa. Sepala 3, e toro annulari obsoleto exorientia, imâ basi connata, longè unguiculata, spathulata, apice cochleariformia, præconcava; 2 postica plùs minùs cohærentia, longiora, texturâ (saltèm post macerationem in acido pyroligneo) coriaceâ exsuccâ. Venula centralis unica, carinuliformis. Stamina 3; duo fertilia sepalis posticis opposita et altè cohærentia; filamenta (libera) brevia, subulata, axi centrali opacâ vasculosâ. Antheræ magnæ, ovales, extrorsæ, conniventes, sinu basilari affixæ, biloculares, longitudinaliter dehiscentes. Stamen tertium, dum adest, rudimentarium, adnatum ungui sepali tertii antici. Pollen 4-6-hedrum, angulis poro vel sulco perforatis. Rudimentum pistilli centrale, capite glanduloso-globoso. Flores fœminei eodem more bracteati. Perianthium deciduum, formâ et divisione varium, modò brevissimum, tubulosum, 3-dentatum, modò longiùs ad medium usque 3-partitum, rarò perianthium masculum æmulans exsertum. Stamina rudimentaria (perianthiorum majorum) 2, dentiformia, minuta. Ovarium globosum, parcè puberulum, basi attenuatâ insuper torum cupuliformem subdiaphanum laxè celluloso-areolatum insertum, et reconditum, ut videtur solidum et omninò cellulosum. Stylus filiformis, deciduus, obsoletè 3-sulcatus, basin versus subtrigonus, epigyno more angustatus discoque obsoleto amplexatus. Stigma capitatum, subtrilobum, aspectu sub lente granulosum. Fructus densè spicatus, sphæricus, parcè puberulus, toro immutato insidens, bracteis e maximâ parte fracturâ lapsis quasi subexsertus, in speciminibus meis subcrustaceus, apice cicatrice areoliformi inconspicuè notatus. Tela centralis, (embryo?) lutescens, e cellulis irregularibus, angulatis, nucleosis, integra vix segreganda. Inter hanc telam et epicarpium tela cellulosa, spongiosa adest. Torus cupuliformis bractearumque bases post fructus persistunt.

Obs. I.—For specimens of this very remarkable plant I am indebted to Mr. Harvey, the founder of the genus, which appeared in the 'Annals of Natural History' (*loc. cit.*), with a note by Sir W. J. Hooker, describing it to be a genus of the natural order *Rhizantheæ* of Blume, group *Balanophoreæ*.

Obs. II.—The central tissue of the fruit, although it is marked off by its yellow tint, has not appeared to me to be separable as one body, breaking up rather on the slight pressure occasioned by attempts at dissection. In this

want of firmness and cohesion it differs considerably from the embryo of *Balanophora* and *Phæocordylis*. So far as I have been able to judge, the appearances presented by it at various stages of maturity are such as would suggest a greater resemblance to a sporuliferous mass, than in any other so-called Rhizantheous plant examined by me.

Obs. III.—It appears to me to be a plant *sui ordinis*, having no relation to any other plant admitted into *Rhizantheæ*, except *Cynomorium**, to which it seems to me to present considerable resemblance in the general structure of the stamen and of the female flower. It is not, perhaps, altogether improbable that the scales forming part of the flowers of both sexes of *Cynomorium* may be found to have a definite relation with the stamen, and with the glandular body from which that organ is represented as arising, and which would appear to be composed of two parts.

Obs. IV.—In bracteation, number and form of the segments of the perianth, the situation of the stamina, the form of the pollen, inferior ovarium and composition of the style and stigma, it presents curious agreements with *Loranthaceæ*. And at present I would consider it (doubtfully) as the homogeneous embryo form of that order, which I take to include *Proteaceæ*, *Santalaceæ*, &c., and which agrees nearly with Dr. Lindley's alliance *Tubiferosæ*.

There are, it will be seen, some discrepancies between my description and that of Mr. Harvey, who however drew up his from recent specimens.

§ 6. Sarcophyte.

Sarcophyte, *Sparrm. in Act. Holm.* xxxvii. 300. t. 7. *ex Endlicher, Genera Plant.* 73. no. 714. *Meletem. Botan.* fasc. 1. t. 11.

Ichthyosma, *Schlectend. Linnæa*, ii. 671. t. 8.

Char. Gen. *Flores* dioici. Mas. *Involucrum* 3–4-phyllum, æstivatione valvatum. *Columnæ staminеæ* totidem, et oppositæ. *Antheræ* indefinitæ, uniloculares, stipitatæ, sacculiformes, circumscissæ, in apice columnarum sitæ. Fœm. *Capitula* nuda. *Ovaria* indefinita, conglutinata; *styli* (solitarii) breves, stigmatibus discoideis terminati. *Fructus* baccatus, compositus (ovariis parùm mutatis); *nuclei* vel *embryones*? tot quot ovaria.

Planta *parasitica, sicca etiam insigniter sanguinea.* Caulis *dodrantalis.* Flores masculi *paniculati; racemis squamâ suffultis, in thyrsum ferè congestis.* Involucri *folia carnosa,*

* Richard, Mém. du Muséum, viii. 420–424. et 431. t. 21.

concava. Caput antherarum *membranâ circumscissâ, in columnam deflexâ, quasi circumcinctum.* Pollen *rotundatum, simplex.* Capitula fœminea *spicata, oblonga, oculo nudo areolata; spicæ paniculatæ basi squamâ suffultæ.* Fructus *moriformes, dispositione et formâ capitulorum.*

Sarcophyte sanguinea (Sparrm.), Meletemata Botan. fasc. 1. p. 11. Harvey, Gen. S. Afric. Plants, p. 300.

Ichthyosma Wiedemanni, *Schlect. in Linnæa*, ii. p. 671. t. 8.

Hab. Ad Caput Bonæ Spei.

Of this very remarkable plant I have only examined dried specimens (subsequently kept in dilute spirits), communicated by Mr. Harvey. It has a peculiar, by no means fungiform habit, the males reminding one of the males of *Nepenthes*: it abounds in red colouring matter.

Obs. I.—The only notices of this plant which I have had access to are those of MM. Schlectendal and Endlicher above cited.

The generic character I have endeavoured to draw up agrees in tenour with the last part of the observation appended by M. Endlicher to the generic character, and though it may be completely erroneous, I think it agrees best with the appearances presented by the male plant; for the filaments or columns of these have rather the relations of bodies axillary to the concave leaves by which they are surrounded, than those of bodies forming a verticillus on a different and inner plane.

Obs. II.—I have not been able to observe the membrane surrounding the base of the antheriferous part of each column in its entire state, its rupture appearing to take place at an early period.

The singular structure of the anthers is also against the supposition of their belonging to single stamina, unless the spaces between the polliniferous cells be found to have arisen from the formation of pollen grains. In all instances, I believe, in which the anther is so formed as to present either the usual cells or irregular cavities, the spaces between these are filled up with solid tissue, being the unaltered portion of the originally solid body. So that I think M. Endlicher's generic description, which relates to many polliniferous distinct bags, covered by a common membrane, itself distinct from those bags, is incompatible with what is known of single stamina.

It may perhaps be said, that the analogies of *Balanophora* are in favour of M. Endlicher's generic character; but it requires, in my opinion, a very exalted idea to be held of the value of parasitism, &c. to conceive any affinity between *Sarcophyte* and *Balanophora*.

I am also led to object to M. Endlicher's remark regarding the anthers of *Sarcophyte* being in some measure analogous to those of *Rafflesia*. To constitute any such analogy, the spaces between the polliniferous bags ("*tubuli*" of Endlicher) must be shown to have disappeared during the formation of the pollen, and the enveloping membrane to have been continuous at one time with the pollen-bags and the spaces between them; even then the analogy would I think be remote. Adopting M. Endlicher's views, the nearest analogical structure would perhaps be the anther of *Rhizophora*.

If the structure be as I suspect, *Sarcophyte* shows a very curious analogy between its male flower and the fructification of certain *Filices*, such as *Cyathea* and *Sphæropteris*.

Obs. III.—In all the ovaria I have examined, chiefly by means of sections, I have observed a white central part, composed of smaller cells; and in this again a brown, generally central nucleus; this nucleus has appeared as it were suspended, being continued upwards into the brown line representing the ordinary canal of communication, which passes directly into the stigmatic tissue. In each of the brown nuclei, for there are not unfrequently two, there is a separable cell, which, when highly magnified, and making due allowances for alteration from having been dried, seems like a membranous bag filled with grumous matter. I have not been able to ascertain what the relations of this are with the surrounding brown tissue, or the changes it may be supposed to undergo during the maturation of the fruit.

It may be observed, that the term "*ovarium uniloculare*," though perhaps strictly applicable, would scarcely suggest itself to the examiner.

The mature nucleus or embryo is of a hard crustaceous consistence; the general appearance is that of some albumens. Under high magnifying powers, the cells of which it is composed present singular appearances, as if their longer faces or sides were encased in armour; from this deposit? the general induration probably arises.

Obs. IV.—The affinities of this genus seem to me very doubtful. Bartling

and Reichenbach refer it to *Cytineæ**; Lindley to *Cynomoriaceæ*†; Endlicher to *Balanophoreæ*‡. To all these, insurmountable objections appear to me to be presented. Even if the structure of the male flowers be as described by M. Endlicher, the females are widely different from those of *Balanophoreæ* (to which botanists seem perhaps most disposed to refer the genus), particularly by their general structure, their much greater general perfection, the union of the ovaria, and the obvious stigmatic surfaces. Perhaps on the whole the general tendency of the plant is towards *Urticinæ*.

§ 7. Thismia.

Thismia, *Griff.*

Locus Naturalis, subregnum *Monocotyledones* inter *Tacceas* et *Burmanniaceas*.

Char. Gen. *Perianthium* superum, campanulatum, (caducum,) 6-partitum, laciniis 3 exterioribus (brevibus), oblongis; 3 alternis, interioribus, longissimis, subulatis; faux annulo semiclausa. *Stamina* 6, fauci inserta, perianthii laciniis opposita, deflexa insuper parietem tubi internum; filamenta brevia, discreta; *antheræ* (maximæ) secus margines connatæ, membranâ bilamellosâ terminatæ, biloculares, loculis parvis distantibus adnatis. *Ovarium* inferum, 1-loculare; placentæ 3 parietales, supra medium ovuligeræ; *ovula* indefinita, anatropa. *Stylus* brevis. *Stigmata* 3, bifida. *Fructus* carnosus, truncato-turbinatus, apice pericarpii circumscisso dehiscens, 1-locularis. *Semina* indefinita, placentis 3 parietalibus, demùm liberis affixa. *Embryo* indivisus, homogeneus.

Planta *pusilla, radicum parasitica, aspectu cereaceo.* Perianthium *luteum, coccineo pictum.*

Thismia Brunoniana.

Descr. Planta aphylla, radicum parasitica, spithamæa vel digitalis. Caulis simpliciusculus, dimidiâ suâ longitudine humo obtectus, crassitie pennæ anserinæ, angulatus. Squamæ (loco foliorum) alternantes, adpressæ, lanceolatæ, acutæ. Bracteæ squamis similes, vel solitariæ sub floribus, vel imbricatæ in pedicellis, interdum flori unico ternæ. Flores pauci, in racemum brevem terminalem dispositi, sæpiùs breviter pedicellati, pro ratione plantæ magni, pulchrè colorati, inodori. Perianthium superum, campanulatum, extùs verrucis plurimis, parùm elevatis, sine ordine evidente dispositis, ovato-oblongis, sublobatis insignitum; tubus basin versus ovario adnatus, anthesi peractâ paullò supra apicem ovarii citissimè circumscissus; faux annularis, circumferentiâ exteriore obsoletè

---

* Ord. Plantar. 81. Conspectus Regn. Veg. 78.

† Intr. Nat. Syst. 394.

‡ Melet. Botan. i. 11. Gen. Pl. 73.

6-angularis (angulis cum laciniis perianthii alternis), dimidium exterius planum, interius elevatum, integrum, tubi aperturam semiclaudens; limbi laciniæ 6, interdùm 5? (et tunc laciniæ subulatæ 2), reflexæ vel patenti-reflexæ, æstivatione imbricatæ; 3 exteriores, breves, oblongæ, obtusæ, subinæquales; 3 interiores angustiores, productæ in processum carnosum, subulatum, longissimum, tubum subæquantem, et in tubum per æstivationem equitantem. Color lætè luteus; tubus secus fasciculos vasculosos numero 12 sanguineo-coccineo vividè pictus, lineolis transversis ejusdem coloris simplicibus fasciculos connectentibus. Stamina 6, annuli faucis basi inserta, perianthii laciniis opposita, intùs deflexa, et arctè ad tubi parietem interiorem applicita. Filamenta brevia, crassa, libera, utrinque lineâ glandulosâ arcuatâ aurantiacâ ex annulo oriente marginata: connectiva plana dilatata margine cohærentia ultra loculos antherarum producta, apice bilamellosa, lamellis sinuato-repandis dentatis, hinc illinc capillaceim divisis; corpus dimidiato-ovatum aspectu grumoso utrinque ad basin lamellarum adest, singulo singulis proximis respondente et massam ovatam centro lineatam antheriformem exhibente; antherarum loculi distantes, oblongæ, pro ratione connectivi parvi, medio lineâ longitudinali latâ e cellulis transversis conflatâ (an lineâ dehiscentiæ) insigniti, verè introrsi sed ob deflexuram staminum extrorsi. Pollen simplex, oblongum, majusculum, glabrum, membranâ tenuissimâ hyalinâ, nucleum centralem e granulis præmobilibus inæqualibus includens. Ovarium tubi parti inferiori adnatum, post hujus lapsum truncato-turbinatum, apice subconicum, in stylum brevem attenuatum, 1-loculare. Ovula numerosa, placentis parietalibus ope funiculorum longorum affixa, anatropa. Placentæ infra medium steriles. Stigmata 3, bifida vel emarginata, conniventia: (vel potiùs stylus tripartitus, laciniis emarginatis vel bifidis, conniventibus, secus latera *continuè* stigmatosis). Fructus carnosus, formâ ovarii, initio stylo terminatus, demùm pericarpii apice circumscisso ore circulari sursùm hians, 1-locularis, polyspermus. Semina indefinita, situ ovulorum, oblongo-ovata, plumbeo-livida, micropyle mammilliformi. Tegumenta bina; exterius cellulosò-areolatum, fragile, facilè separandum; interius tenuissimum, membranaceum, vix separandum, massam cellulosam (embryonem) cereaceam, e cellulis materic grumosâ moleculari et oleaginosâ farctis conflatam continens. Placentæ seminibus lapsis discretæ fiunt. Fructus vacui demùm marcescunt.

Hab. Ad pedes Bambusarum in humo ligno semiputrido farcto prope Palar Oræ Tenasserim. Grad. Lat. 12° 50′. Long. 98° 20′. Flores et fructus protulit mense Octobris, A.D. 1834*.

---

* I found associated with this plant a species of *Salomonia* and another of *Burmannia*, both of the ordinary appearance of plants parasitic on roots: of the former I subjoin a character:

Salomonia aphylla, parasitica, floribus pentandris.

Herba spithamæa, parum ramosa, pallide brunnea, prædita squamis lanceolato-ovatis, pallidis, loco

Obs. I.—By this singular plant I would wish to commemorate the late Mr. Thomas Smith, the discoverer of one of the most important points of vegetable structure, on which a very general rule has been founded. To his great merits the following quotation from Mr. Robert Brown's remarks on *Kingia* bears the most satisfactory testimony:—"I was aware of the existence, in several plants, of a foramen in the coats of the ovulum, always distinct from, and in some cases diametrically opposite to, the external umbilicus, and which I had in no instance found cohering either directly with the parietes of the ovarium or with any process derived from them. But as I was then unable to detect this foramen in many of the plants which I had examined, I did not attach sufficient importance to it; and in judging of the direction of the embryo, entirely depended on ascertaining the apex of the nucleus, either directly by dissection, or indirectly from the vascular cord of the outer membrane; the termination of this cord affording a sure indication of the origin of the inner membrane, and consequently of the base of the nucleus, the position of whose apex is therefore readily determined. In this state of my knowledge the subject was taken up in 1818 by my lamented friend the late Mr. Thomas Smith, who, eminently qualified for an investigation where minute accuracy and great experience in microscopical observation were necessary, succeeded in ascertaining the very general existence of the foramen in the membranes of the ovulum. But as the foramina in these membranes invariably correspond with each other and with the apex of the nucleus, a test of the direction of the future embryo was consequently found nearly as universal and more obvious than that which I had previously employed."—Appendix to Capt. P. P. King's Coasts of Australia, ii. p. 541.

---

foliorum. Spicæ bracteatæ, densifloræ. Flores minuti, pallidè brunnei. Capsula ecristata. Semina albuminosa. Embryo dicotyledoneus.

The *Burmannia* belongs to a form not uncommon in some parts of India characterized by an absence of ordinary leaves and green colour, small stature and few flowers, which are either white or blue. It would appear to approach the *Gonyanthes* of Blume. While *Salomonia aphylla* is curious as an instance of specific parasitism on roots, unaccompanied by the ordinary modification of form of the embryo, *Burmannia* is perhaps equally curious for exhibiting instances of the form of embryo usually associated with parasitism on roots, in connexion, in one form, with apparent parasitical habits, in the other with leaves apparently of ordinary structure and function.

OBS. II.—The venation of the perianth appears to me worthy of notice. The tube is supplied by simple vascular fascicles, double in number to the laciniæ: of these, those alternating with the laciniæ terminate at or near the sinuses by passing off on either side into the laciniæ themselves, with the central fascicles of which they sooner or later combine. The fascicles corresponding to the axes of the component parts of the perianth are simple throughout, with the exception of a branch that passes off into each filament: those of the shorter laciniæ terminate manifestly within the apex.

OBS. III.—After the opening of the fruit, which takes place by the separation of the free apex of the pericarpium, the fruit does not undergo much change: in some of my specimens it at last appears to be deliquescent or marcescent, the rim first disappearing. From the general appearance shortly after the escape of the seeds, and particularly from the resemblance of the then free placentæ to some forms of abortive stamina, I had at first taken them to be neuter flowers, and indeed had described them as such.

OBS. IV.—In the number and situation of the parts of the flower, the placentation, the direction of the stamina (which appears to present great obstacles to independent impregnation), and in some measure their structure, this genus may I think be well compared with *Tacca*. And it was this obvious affinity, together with the remarkable agreement it presents with *Burmannia** in the structure of its seeds, that induced me long since to refer it to the *Monocotyledonous* division of *Vegetabilia*. This view is I think borne out by the general structure of the plants, especially, perhaps, by the apparently uniseriate opposition of the stamina to the laciniæ of the perianthium, which appears to me quite that of those *Monocotyledones* in which the stamina are equal in number to the two series of the perianthium. The only objection, indeed, as it appears to me, consists in the occasional quinary variation by suppression in number of parts, which, however, as it would appear to affect the inner series of the perianthium, is not perhaps of a very important nature.

There are however other speculative reasons connected with the system of

* Neither is the remarkable form of anther nor the venation of the perianth incompatible with the structure of *Burmannia*. The resemblance, again, of the dilated points of the styles, and the direction and form of the stigmatic openings of this last genus with those of *Tacca*, in which the stigmata are very incorrectly described, appear to me worthy of notice.

interchange, as it were, of structure and representation of form, which lead me to consider this as a *Monocotyledonous* form of the albuminiform homogeneous embryo, and as the analogue of *Rafflesiaceæ* and *Cytineæ* of *Dicotyledones*. These speculations I have endeavoured to illustrate in that part of the present memoir which is intended to show that the group *Rhizantheæ* cannot be concentrated so as to be placed after *Monocotyledones*, or indeed after any of the primary divisions, but that it presents types appertaining to both *Dicotyledones* and *Monocotyledones*.

EXPLANATION OF THE PLATES.

Tab. XXXIV.

Fig. 1. Male flower of *Sapria Himalayana*, just before expansion:—of the natural size.
Fig. 2. Section of the same.
Fig. 3. Anther, viewed laterally; 3 *a*, 3 *a*, vertically:—magnified.
Fig. 4, 4. Longitudinal sections of the same.
Fig. 5. Half of longitudinal section of the same, viewed somewhat obliquely.
Fig. 6, 6. Transverse sections of anther.
Fig. 7. Part of the *Endothecium*, highly magnified.
Fig. 8. Pollen, seen with $\frac{1}{10}$ m. (after long maceration).
Fig. 9. The same, fresh, seen with a simple lens of $\frac{1}{20}$ focus.
Fig. 10. A hair from the apex of the column:—highly magnified.
Fig. 11. Mode of parasitism.

Tab. XXXV.

Fig. 1. Female flower of *Sapria Himalayana*:—of the natural size.
Fig. 2. The same, longitudinally divided.
Fig. 3. Part of a placenta:—magnified.
Fig. 4, 4. Two of the ovula:—highly magnified.

Tab. XXXVI.

Fig. 1. Plant of *Thottea grandiflora*, reduced about $4\frac{1}{2}$ times.
Fig. 2. Fruit of ditto, reduced in the same proportion.
Fig. 3. Flower, of the natural size.

Fig. 4. *Corona staminea* and *stigma*, after the removal of the perianthium, seen laterally:—magnified.
Fig. 5. The same, seen vertically.
Fig. 6. A stamen, seen in front, before dehiscence:—more magnified.
Fig. 7. The same, after dehiscence.
Fig. 8. Pollen, dry:—highly magnified.
Fig. 9. The same, in water, ditto.
Fig. 10. A transverse section of the ovarium:—magnified.
Fig. 11. Part of the placenta with two ovula.
Fig. 12. Ovulum:—still more magnified.
Fig. 13. Fruit, after dehiscence, reduced 3 times.
Fig. 14. Portion of the placenta of the same, with two seeds:—magnified.
Fig. 15. Seed:—much magnified.
Fig. 16. Longitudinal section of ditto.
Fig. 17. Embryo:—still more magnified.

TAB. XXXVII.

Fig. 1. Plant of *Asiphonia piperiformis*:—of the natural size.
Fig. 2. Section of stem.
Fig. 3. Expanded flower, seen in front:—magnified.
Fig. 4. Stamen, seen in front:—much magnified.
Fig. 5. Pollen:—highly magnified.
Fig. 6. Column, seen vertically:—much magnified.
Fig. 7. Column, base of perianthium, and apex of ovarium, seen laterally.
Fig. 8. An ovulum, in its earlier stage.
Fig. 9. The same, at a later period, cut longitudinally.
Fig. 10. Fruit, after dehiscence:—of the natural size.
Fig. 11. Transverse section of placenta:—magnified.
Fig. 12. Seed, seen on its inner face or angle:—much magnified.
Fig. 13. The same, cut longitudinally.

TAB. XXXVIII.

Fig. 1. Male plant of *Sarcophyte sanguinea*:—of the natural size.
Fig. 2. Involucrum before dehiscence:—magnified.
Fig. 3. The same expanded, showing the male flowers.
Fig. 4. Male flower: the apex of the pedicel is seen to be surrounded by a sublaceral reflexed membrane, the remains of the perianthium:—more magnified.

Fig. 5. Transverse section of staminal disc.

Fig. 6. Two stamina, with portions of the disc:—still more magnified.

Fig. 7. Pollen:—$\frac{1}{16}$ m.

Fig. 8. Female plant:—of the natural size.

Fig. 9. Longitudinal section of a female capitulum:—magnified.

Fig. 10. The same of a single ovarium, or such part of the capitulum as corresponds to one:—much magnified.

Fig. 11. Longitudinal section of part of a ripe fruit, corresponding to one pericarpium.

Fig. 12. Nucleus of the same.

Fig. 13. One of the component cells of the same:—$\frac{1}{4}$ m.

Tab. XXXIX.

Fig. 1, 1, 1. Plants of *Thismia Brunonis*:—of the natural size.

Fig. 2. Alabastrum:—magnified.

Fig. 3. Perianthium (upper part) just after separation from ovarium:—magnified.

Fig. 4. Vertical view of faux of the same.

Fig. 5. Uppermost part of perianthium laid open and spread out, with the antheræ turned up:—more magnified.

Fig. 6. Stamen and part of *corona faucis*, in the natural position:—highly magnified.

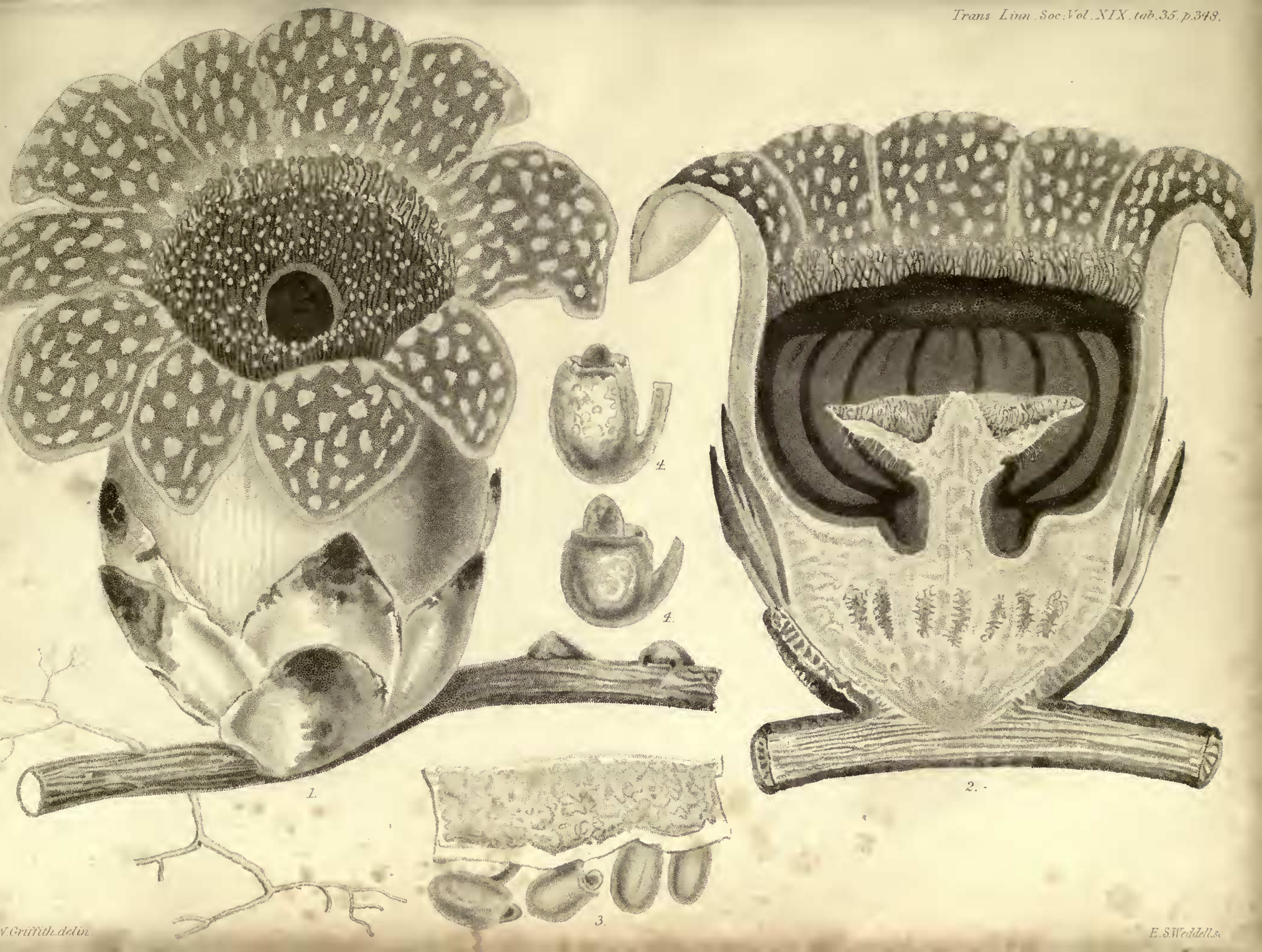
Fig. 7. The same, inverted in front.

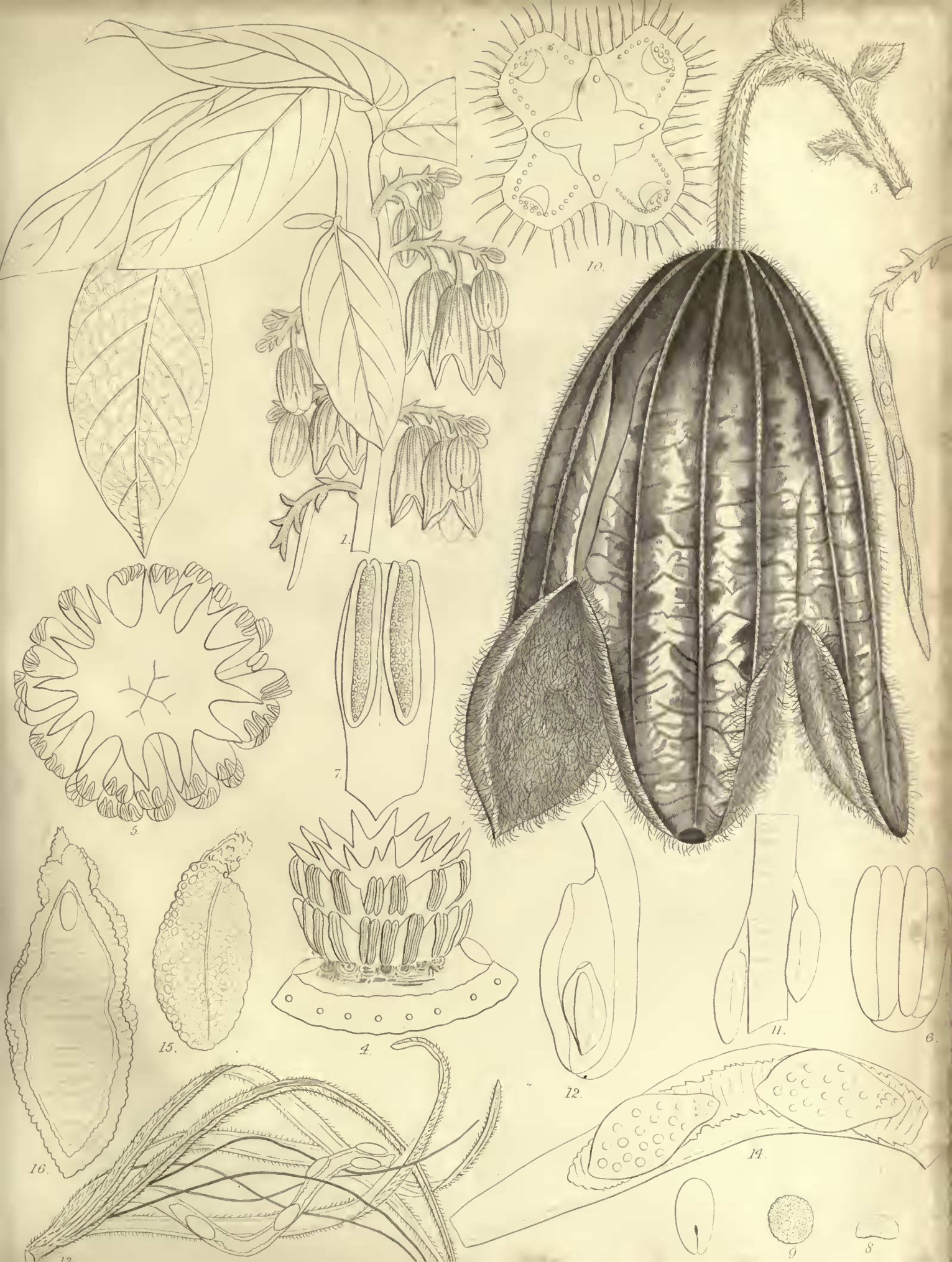
Fig. 8. Pollen:—$\frac{1}{25}$ triplet.

Fig. 9. Young ovarium and style, laid open:—magnified.

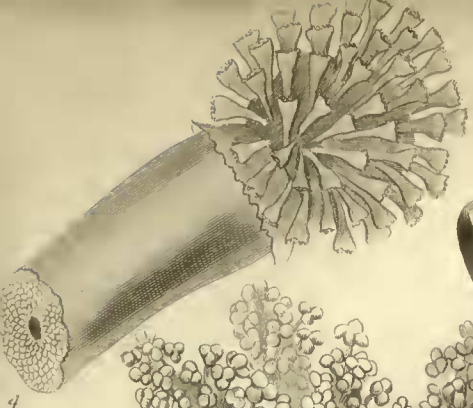
Fig. 10. A ripe seed:—much magnified.

Fig. 11. Embryo, enclosed in the inner tegument.


4.
4.
1.
2.
3.


1.
3.
10.
5.
7.
4.
15.
16.
12.
11.
6.
14.
9.
8.

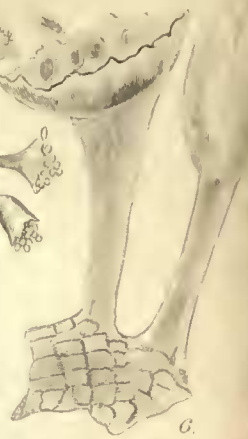

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.


4.


3.


2.


5.


6.

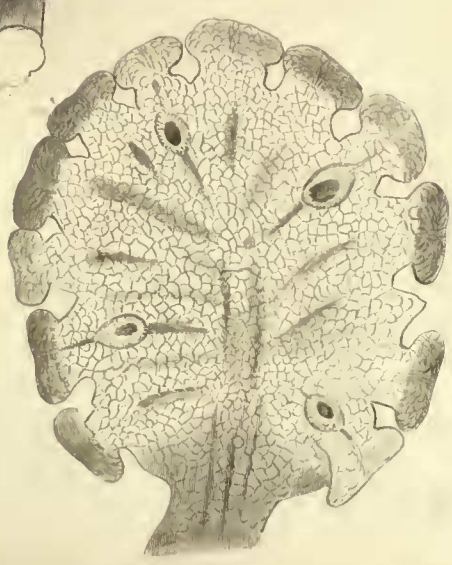

7.


1.

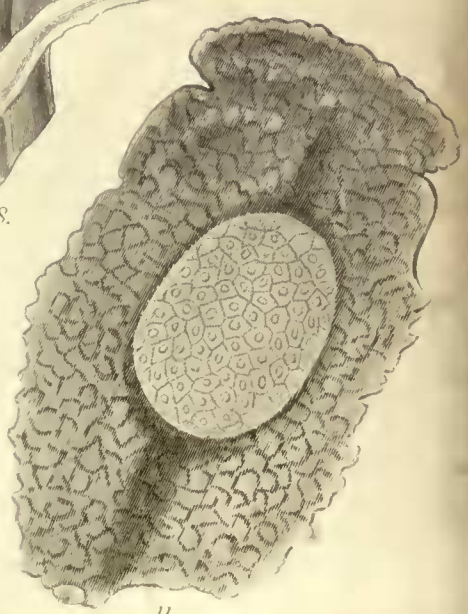
8.

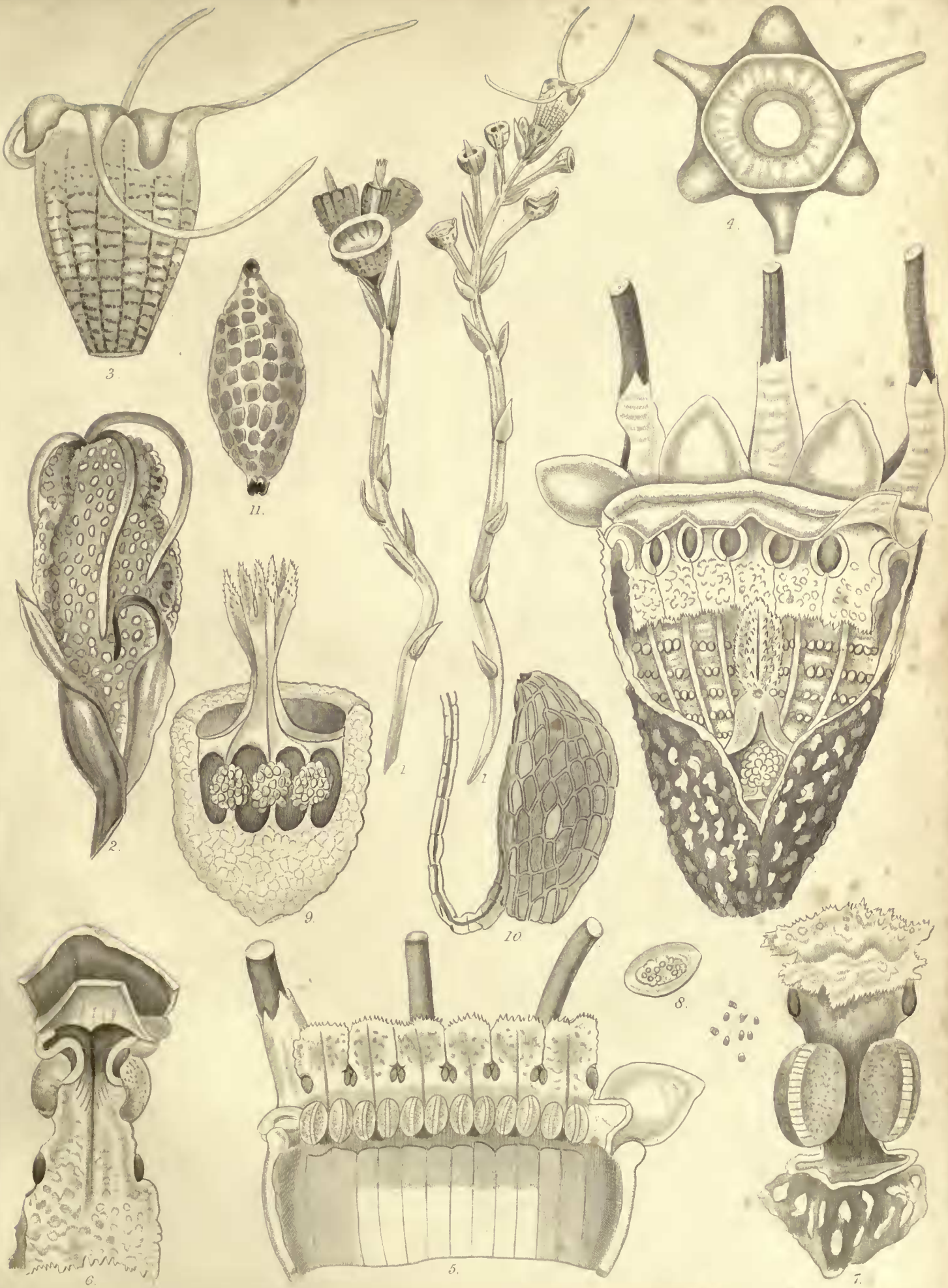
12.


10.


9.


13.


11.


3.
4.
11.
1
1
2.
9.
10.
8.
6.
5.
7.